THE OLD TIMER'S BULLETIN

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Published for the Collector, Historian and Old Time Wireless Operator

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The "Old Timer's Bulletin": The AWA Journal

The *Old Timer's Bulletin* is published approximately four times a year, on a volunteer basis, by and for members of the Antique Wireless Association, Inc. AWA is a nonprofit historical society founded in 1952 and chartered by the State of New York. The *Old Timer's Bulletin* is available only as part of AWA membership. Its issuance is subject to change from time to time as to frequency, content, and size. This publication does not accept paid advertising. It is not liable in any way for any buying and selling transaction entered into as a result of its contents.

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BK-OTB Award: Bill Denk
Equipment Awards: Ralph Williams
Taylor Award: Ross Smith
Tyne Award: Lauren Peckham

WHOM TO CONTACT

Dues and address changes: Joyce Peckham (Secretary), Box E, Breesport, NY 14816, (607) 739-5443. Dues (make check payable to AWA): 1 year, $12; 2 years, $22; overseas (airmail), $15.

Bulletin material (except ads or book reviews); orders for the AWA Review or OTB back issues: Ludwell Sibley (Editor), 44 E. Main St., Flemington, NJ 08822-1224, (908) 782-4894.

Want ads, information on regional and joint meetings: Richard Ransley (First Vice President), Box 41, Sodus, NY 14551.

Book reviews, museum operation: Bruce Kelley (Curator), 59 Main St., Bloomfield, NY 14469.

AWA official business: Bruce Roloson (President), 2577 Rittmer Ln., Seneca Falls, NY 13418.

Annual conference: William Fizette (Second Vice President), RD 1, Box 55, Henryville, PA 18332.

Financial reports: Dexter Deeley (Treasurer), 8 Briar Circle, Rochester, NY 14618.

Please write legibly. Enclose an SASE for prompt reply.

AWA NETS (EST)

PHONE:

Sun. 7247 kHz SSB, noon (NCS N4FS)
3837 kHz, QRP & AM, 5 PM, Nov. thru April (NCS: W2ICE & AA2CU)

Tues. 14274 kHz SSB, 2:30 PM (NCS: KC3YE and W0FXY))
3837 kHz SSB, 8 PM (NCS N4FS)

Mon.-Wed.-Fri. 3867 kHz, 9:30 AM (NCS W2ICE and W2SHN)

CW:

Daily, 4 PM, 7050 kHz (NCS varies)
First Wed. of each month, 8 PM, 7050

2-M REPEATER (Rochester area):
Mon., 7:30 PM (NCS: W2ICE)
Receive 146.820; transmit 146.220

FROM THE EDITOR

Ludwell Sibley, KB2EVN

AWA GETS 4000TH MEMBER

Sure enough, Association membership has grown past the 4000 mark. It was a bit less in November, but then dozen or so more applications came in.

AWA REVIEW, VOL. 8

This is a "call for papers" for Review 8. We have a couple of excellent, and lengthy, features coming up, but there is room for more. For the "Hints for AWA Authors" sheet or for any further information as to schedule, etc, please contact the Editor.

VOICEMAIL FOR CLUB PROMOS

The California Historical Society has a clever application for telephone-company voicemail service: a "news line." By dialing (415) 978-9100, the caller gets information on the places and times of upcoming meets and the basics on membership. At the end of the message, which runs about two minutes, the caller can leave a message for further info. This looks like a way to "get the word out" without the bother of an answering machine and special telephone line. It should greatly reduce the miscellaneous calls for information that go to club officers . . . "using new technology to promote old technology."

NAVY SUPPLIERS

Fred Chesson's listing of Navy manufacturer codes in AWA Review 7 is an interesting research aid. I've had a Navy (Marine Corps) MAB transceiver for some time - roughly comparable to the Army's BC-611 handie-talkie or BC-745 "cavalry" transceiver, packaged in a strap-to-the-chest case. These sets bear no nameplate, just cryptic stampings like "CCI-43085 of MAB." However, using the Chesson list, it turns out that the CCI-43085 main chassis was made by Communications Company, Inc.; likewise the CCI-66081 antenna. The CRF-21221A vibrator power unit came from Radiart, while the CZP-10162 bakelite case originated with Plastimold, Inc. The CTE-49212 antenna connector was from Telephonics Corp., and the CUP-49215 headphones derived from United Pressed Products. Chesson's list thus adds some detail on an otherwise obscure radio!

CONGRATULATIONS

To *Antique Radio Classified*, which has recently put out its 100th monthly issue, whose circulation is now above 7500, and whose size is running about 100 pages. Here's to the next 100 issues . . .

NEEDED: BC RECEIVER STORIES

The *OTB* needs more articles on broadcast sets, their history, their restoration, the collector market, etc. Article copy and good photos are welcome.

THE COVER

February is Valentine's month, and this *OTB* has a cluster of stories on crystal receivers, so this mid-Twenties illustration seems to fit.

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AWA NEWS

CALENDAR

Feb. 6 - CHRS meet, Redwood City
Feb. 7-8 - 1993 Classic Radio Exchange
Feb. 10-11, 13-14 - AWA Old-Time Contest
Feb. 13 - OKVRC meeting, Oklahoma City (also Mar. 13, Apr. 10)
Feb. 12 - NJARC monthly meeting (also Mar. 12, Apr. 9)
March 20 - NJARC Swapmeet, Hightstown
March 26-27 - AWA SE Meet, Monroe, NC
May 1 - Spring Meet, Bloomfield, NY
May 1 - CHRS meet, Redwood City
May 15 - AWA Tranquility Meet, NJ*
May 15 - CHRS picnic
May 20-22 - IHRS/AWA Spring Meet, Kokomo*
Sept. 22-25 - AWA Conference, Rochester*
Oct. 23 - HARPS Show, Middletown, NY*

* Details in future OTBs

RECURRING MEETINGS

California Historical Radio Society - quarterly swapmeets in the Ampex parking lot in Redwood City (Feb. 6, May 1, Aug. 7, Nov. 6). Gates open at 8:30 AM. Regional events: Picnic at Tilden Park, May 15 (contact: Paul Bourbin, (415) 648-8489); San Luis Obispo swapmeet, June (date to be chosen; contact: Dan Steele, (805) 544-2904); San Francisco swapmeet, July 10 (contact: John Wentzel, (415) 731-1920); Fairfield swapmeet (contact: Paul Bourbin); Redding swapmeet, October (date to be chosen; contact Norm Braithwaite, (916) 246-4209). General address is CHRS, PO Box 31659, San Francisco, CA 94131; 24-hour voicemail info: (415) 978-9100. (Mike Adams)

New Jersey Antique Radio Club - monthly meetings the second Friday of each month (Feb. 14, Mar. 13, April 10) at 7:30 PM. See contact below.

Oklahoma Vintage Radio Collectors - monthly meetings the second Saturday of each month (Feb. 13, Mar. 13, April 10) at Gary Dales BBQ, NW 63rd and May Ave. in Oklahoma City. Dinner and socializing starts at 6 PM, meeting at 7. More info: SASE to OKVRC, PO Box 72-1197, Oklahoma City, OK 73172-1197, or call (405) 722-0595 or (405) 755-4139 eves.

NEW JERSEY MEET

Saturday, March 20

The New Jersey Antique Radio Club will hold an indoor swapmeet at the Hightstown Country Club on March 20, 8 AM - 3 PM. Site is near Exit 8 of the New Jersey Turnpike and Route 33. From the Turnpike, go east on Rte. 33 approximately 200 yds. (beyond Mom's Peppermill restaurant); continue ¼ mi. to the first jughandle, and go west. At the first traffic light, take Monmouth St. 300 yds to the Country Club on the left. Preregistration required for sellers: members, $12 per table; nonmembers, $15. For out-of-area visitors, accommodations are available at the Town House Motel on Rte. 33 [800-922-0622, or (609) 448-2400] at special rates - mention the radio meet. Contact: send SASE to Tony Flanagan, 92 Joysan Terrace, Freehold NJ 07728, (908) 462-6638, or call John Ruccolo, (609) 426-4568.

NORTH CAROLINA MEET

Friday & Saturday, March 26-27

The AWA Southeastern meet will take place at the Union County Farmers' Market in Monroe, starting Friday noon. As was done last year (see Robert Lozier's report in the August *OTB*), no one will be allowed on-site before this time.

The Market is a great place for a radio meet. There is a large covered area with almost unlimited parking around it. This year we are reserving the covered spaces by preregistration, first-come-first-served. There are 29 10' x 20' spaces under cover. Registration is $5; a vendor pass (required to sell) is $10.

Friday

Noon Trading in flea market
7:30 Open house, home of a local collector

Saturday

7:00 Trading in flea market
10:00 Check in equipment for contest
1:00 Contest room open for viewing
1:30 Contest wrap-up, by Robert Lozier
2:00 Program: "Kit Sets of the 1920s" (Dr. Dennis Osborne), "Radio Circuits" (John Allen), "Hints & Kinks" demos

For more information, please contact Ron Lawrence, KC4YOY, PO Box 220094, Charlotte, NC 28222-0094, (704) 289-1166. (Ron Lawrence)

NEW YORK SPRING MEET

Saturday, May 1

Local AWA meet, dinner, and sale at the AWA Annex and American Legion Hall, NY 5 & US 20, Bloomfield, NY (2 mi. east of the Museum).

9:00 Flea market, until noon
10:30 **Auction** of miscellaneous equipment (receivers, speakers, amplifiers, stuff) at Annex. Everything goes, no minimum.
Noon **Buffet dinner** ($7, incl. auction card).
1:00 **Auction** of members' equipment. Direct, seller to buyer, no minimum. Auction card required ($1 at door) to help defray facility cost.

Dinner reservations *must* be made before April 28; reservations cannot be accepted at the door.

(Continued on p. 46)

1993 CLASSIC RADIO EXCHANGE

February 7-8, 2000 UTC to 0400 UTC. A good way to warm up for the AWA OT Contest. The Classic Exchange, "CX," is a celebration of the commercial and homebrew equipment that was the pride of our ham shacks just a few short decades ago. Object is to restore, operate and enjoy older equipment with like-minded amateurs. A Classic Radio is at least ten years old, an advantage but NOT required to operate CX. You can use anything, although new gear is a distinct scoring liability and not as much fun!

Exchange your name, RST, QTH, receiver and transmitter type (homebrew, send final-amp tube or transistor) and other interesting conversation. The same station may be worked with different equipment combinations on each band and each mode. On CW call "CQ CX," on phone call "CQ Classic Exchange." Non-participants may be worked for credit. Suggested frequencies: CW up 60 kHz from low band edges; phone 3880, 7290, 14280, 21380, 28320; Novice/Tech 20 kHz up from low band edges. 7060 and 3560 tend to be the most popular CX frequencies.

Scoring: multiply total QSOs (all bands and modes) by the following sum: (total number of different receivers and transmitters worked on each band and mode plus the total number of states/provinces/countries worked on each band and mode). Multiply that total by your Classic Multiplier: the total years old of all receivers and transmitters used, three QSOs minimum per unit to qualify. If equipment is a transceiver, multiply age by two. If homebrew, count as 25 years old unless actual construction date or design is older.

Certificates are awarded every now and then for the highest score, exotic equipment, the best excuse, and other unusual achievements. Send logs, comments, anecdotes, pictures to: Jim Hanlon, W8KGI/5, PO Box 581, Sandia Park, NM 87047; or Marty Reynolds, AA4RM, PO Box 13354, Atlanta, GA 30324. Include SASE for the next *CX Newsletter*. (Stu Stephens, K8SJ)

AWA BUSINESS/BOARD MEETING

The 1992 annual membership and Board meeting was held Nov. 3. Directors reelected for 1993-95 were Art Albion, Bill Fizette, Henry O'Meara, Lauren Peckham, Dick Ransley, Bruce Roloson, and Ludwell Sibley. Resigned members are Chuck Bliley, Glen Fuller, and John Ward.

Financial matters, reported by treasurer Dexter Deeley, are stable but require careful management, given the expenses of present-size OTBs and the larger Conference, and the lower interest income currently delivered by CDs.

Joyce Peckham as Secretary reported on the membership level: 3993 as of the report date (3672 U. S., 161 Canadian, 160 foreign), or up 8% over a year ago. Coverage in the AARP newspaper attracted 164; the *Forbes* story, a few more.

Richard Ransley reported on the variety of local and joint meets that took place during the 1992 season. He continues to have slide and video shows available for these events (see the listing in the Feb. 1991 *OTB*, p. 47, for details).

Bill Fizette reported on the Conference: it ran relatively smoothly despite record size - over 900 registrants and over 1000 overall attenders. The chartered bus to the Museum had low usage but is expected to be retained. The Book Fair is viewed as having worked well. In the auctions, good-quality items sold high. Lauren Peckham covered programming: average attendance in the sessions was 125. Participation in the Equipment Contest was down this year, so will receive emphasis in 1993. The special theme for 1993 will be "Westinghouse." Ed Gable reported on the flea market. Spaces initially available were 164, but 264 requests were received, most of which were accommodated by spaces added on a quick-reaction basis. For next year, preassignment will be continued, but with refinements.

Lauren Peckham presented Bruce Kelley's Museum report because of the latter's absence due to illness. Attendance and traffic continue as usual. The guide list and training manual worked well this year. Coordination of the guides will be taken over by Art Kelly. Work at the Annex continues, with the new tube room and alarm system.

Morgan Wesson discussed the videotaping of sessions from the Conference and plans to edit the tapes into cassettes loanable for other meetings.

Ludwell Sibley reported on the ongoing status of the *OTB* and Review. The approved 1993 budget includes funding for Review Vol. 8. Sibley also proposed a resolution of thanks to long-term "Key & Telegraph" writer Lou Moreau, W3WRE. The approved resolution is:

Whereas Lou Moreau, W3WRE, has contributed to the history of the telegraph and its special instrument, the key, since the earliest days of AWA publications and conferences; therefore be it resolved that the Board expresses its gratitude to her for longstanding service, and wishes her continuing enjoyment of this historical specialty.

President Roloson proposed that Lou be made an honorary member of AWA, a motion voted in by the Board.

WANTED: EARLY TV ENGINEERS

Television historian Richard Brewster has been trying valiantly to locate television engineers from the 1930s and early 1940s to research TV development. He is interested particularly in the early cameras - schematics, etc. If you are such a person or know one, please contact Richard at 454 Diablo Drive, Pittsburgh, PA 15241, (412) 833-4287.

SILENT KEYS

(AWA members, amateur licensees or not)

Warren Baker
William W. Baker
Curtis A. Burgan, WA6MAV
Ralph V. Rickett, W8BTW
Kaye Weedon, winner of the 1983 AWA Houck Award for historic documentation.

OTB BACK ISSUES

The following *OTB* back issues are in stock and orderable via AWA, 44 E. Main St., Flemington, NJ 08822-1224.

Volume and Number

18-3 20-1 20-3 20-4 21-2 21-3 25-3
27-1 27-2 33-1 33-2

Also, in Vols. 22-24, 26 and 28-33, *all* four numbers of *each* volume are available. This includes several *OTB* issues from the past three years with special themes. They contain the normal columns, etc., but also a core of features centered on a particular topic area. The number of special-focus pages in each issue is listed below.

Anniversary Special ("Best of *OTB*, 1960-82") (33-2, June 1992) - 48 pp.
Broadcast Receivers (30-4, Feb. 1990) - 12 pp.
Communication Gear (32-1, May 1991) - 18 pp.
International topics and equipment (31-4, Feb. 1991) - 11 pp.
Military equipment in both wars (30-3, Nov. 1989) - 17 pp.
Restoration (31-2, Aug. 1990) - 20 pp.
Tubes (incl. light bulbs)(31-3, Oct. 1990) - 19 pp.
Wireless equipment and stations (31-1, May 1990) - 15 pp.

Prices are $2.50 each postpaid. Comprehensive index to *OTB* Vols. 1-32 and Review Vols. 1-6, free on request with purchase. [LAS]

THE OUGHTRED SOCIETY - HONORING THE SLIDE RULE

Much of the design work on early electronic components and equipment was accomplished with the aid of the slide rule. An example is provided by Edward Herold on p. 20 of the AWA Review, Vol. 7: describing his work on the Type 89 tube, he says "I would go out on the factory floor with my slide rule and a head full of approximation formulas." The introduction of the handheld scientific calculator in 1972 marked the end of the slide rule as the engineer's trusty aid.

However, the slide rule has not disappeared - it is being honored by a group dedicated to it. The nonprofit Oughtred Society was formed in 1991 for people interested in the history and collection of slide rules. William Oughtred was a 17th-century English mathematician who is generally recognized as inventor of the slide rule. The Society publishes a journal and a swap sheet. Meetings have been held in each of the past two years, with exhibits and exchanges of information.

For questions or information on membership, please contact Osborne Price, 8338 Colombard Court, San Jose, CA 95135, (408) 238-8082. (Osborne Price)

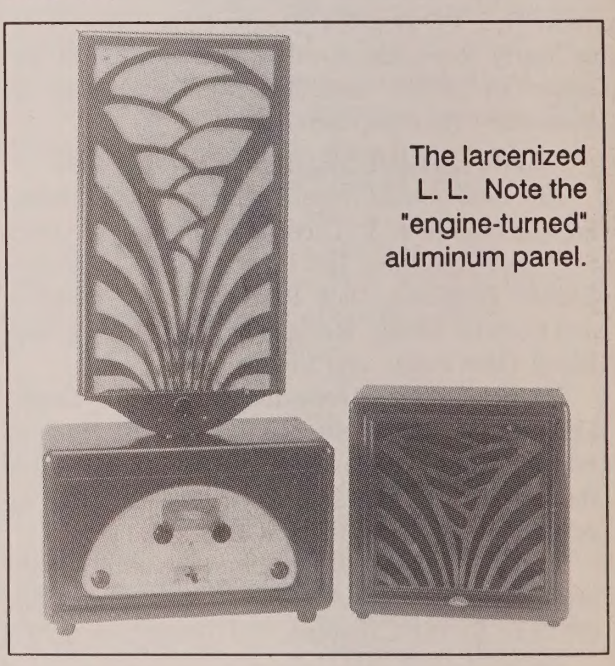
(Inspection of the table of contents of the *Journal* reveals articles like "Comments on Slide Rule Nomenclature," "The Hart Equationar," "Slide Rule Pencils," "Gilson Slide Rules Revisited," and "Chronology of Japanese Slide Rules." This looks like a fertile and rewarding area for some of us who began our careers in electronics with this once-indispensable aid. The "trade list" shows great diversity - slide rules most of us never heard of - and collector claims of having up to 700 rules available to trade. (LAS)

AUTHORS RECEIVE R. C. OF A. AWARDS

Lou Moreau, W3WRE, has been given the de Forest Award, and Tom Lewis has been presented with the Batcher Award, by the Radio Club of America. This recognizes their achievements in documenting radio and telegraph history. Ralph Williams, N3VT, made one of the presentations at the annual R. C. of A. dinner in November.

THEFT ALERT

We are advised of a theft, from the Archeofon exhibit held with an AIRE swapmeet in Bassano del Grappa, Italy on October 6. The stolen receiver is a French-made L. L. (Lucien Lévy) eight-tube Syncodyne of 1927 with accompanying, matching loop antenna and cabinet speaker. This unique set, styled by Bugatti of sports-car fame, may be offered for sale. The owner is Riccardo Kron, Via Machiavelli, 12/A, 36061 Bassano del Grappa, Italy, telephone 01039-424-523228, fax 01039-424-524395. (Information from Eunice Eckstein)



The larcenized L. L. Note the "engine-turned" aluminum panel.

A SPECIAL TIME RECEIVER FOR OBSERVATORIES

Paul Giganti, W6GVY
2429 San Carlos Ave., San Carlos, CA 94070

The early Tissot crystal receiver in the photos, a specialized design for receiving time signals, is in the Giganti collection, having been restored by Woody Wilson, WA6KVW. The text below is translated from the catalog in which it was advertised, that of Ph. and F. Pellin, Engineers-Constructors, in Paris. The set is particularly novel in that it includes a way to measure the forward and reverse current of the crystal detector, permitting adjusting the catwhisker for best sensitivity in the absence of the actual signal.

N°. 2 - SPECIAL TIME RECEIVER FOR OBSERVATORIES

of C. Tissot and Felix Pellin

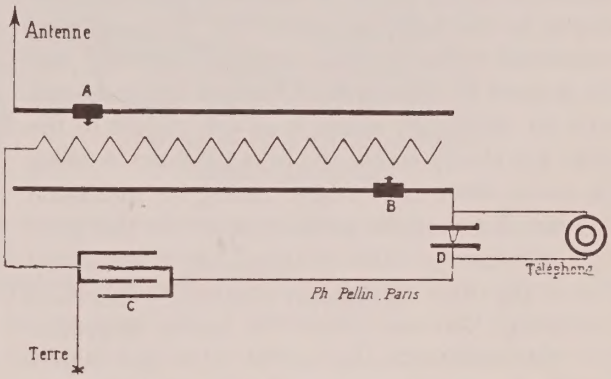
This apparatus was presented to the Academy of Sciences by M. Lippmann, November 2, 1908.

DETERMINATION OF LONGITUDE
DESIGNED FOR OBSERVATORIES, YACHTS, PACKET BOATS.

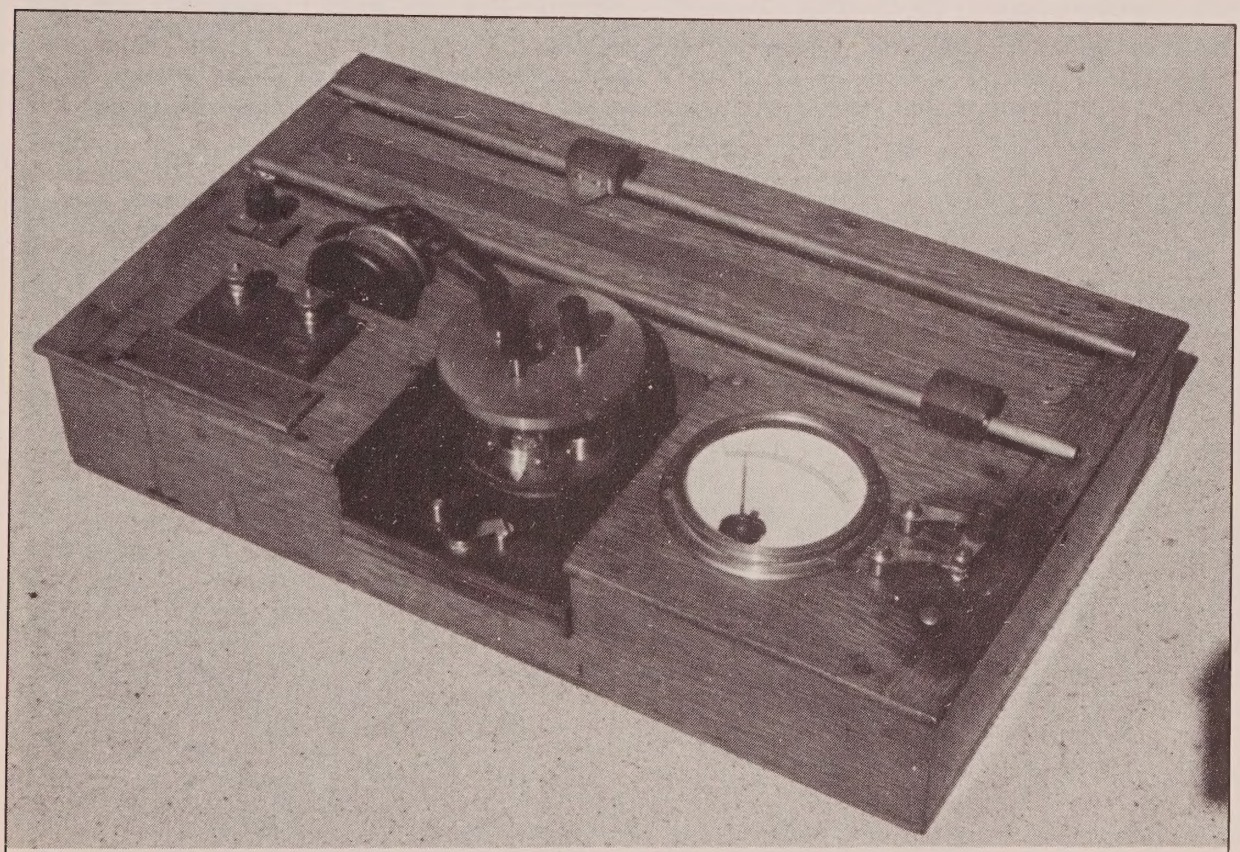
This receiver is made, like its predecessor, with a rectifying detector and a tuning system for immediate use with even a mediocre antenna.

The telephone receiver, which has been extensively studied and designed to receive radiotelegraph signals, possesses a very high resistance and presents high sensitivity.

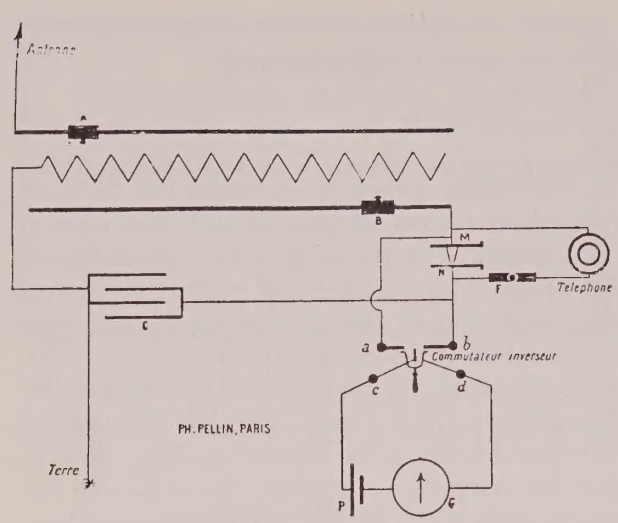
The tuning system is an Oudin resonator, of rectangular section, whose primary is connected to the antenna, while the secondary, which makes up the resonant circuit, is linked to the terminals of the detector by an intermediate condenser. Two sliders A and B move along the length of the solenoid and permit adjusting operation of the circuits. The primary circuit is made up of the antenna, the left-hand portion of the solenoid as far as slider A and the connection to ground. The secondary circuit is made up of the portion of the solenoid between the left end and slider B.



This system, which makes tuning the primary and secondary circuits relatively independent of



Brass and oak: the two tuning sliders at the top, with a scale calibrated in centimeters between them. Triple detector mounting in the center. Test meter and battery-reversing switch at right.



each another, permits very quick operation. The operation of the sliders is accomplished most efficiently in the following way: the antenna being connected to the terminal marked "antenna" and the ground to the terminal marked "ground," one puts the secondary slider B in the middle of the scale and slowly moves the primary slider A along the scale, from left to right, tuning for maximum volume. Leaving the primary slider in this position, one moves the secondary slider in one direction or the other in order to improve reception, if necessary. One can perfect the tuning by successive approximations, but never move the sliders simultaneously, always one after the other.

To insure that the detector functions normally, there is auxiliary circuitry for checking. To verify good functioning of the detector, one proceeds in the following fashion:

Withdraw the plug F so that the battery current does not enter the phone. Activate the toothed button M of the detector to assure contact between the crystal and the catwhisker. Third, pass current from the battery P into the meter G with the aid of the reversing switch I. By reversing the two positions to the right and then the left, one can pass the battery current in one direction or the other: this assures production of a distinct deflection of the meter needle for one of the two positions without a detectable deflection for the other.

Otherwise, the contact will not have the desired sensitivity and it is advisable to change the contact pressure of the detector button. One should observe the needle of the meter deflect several divisions on the dial. (These divisions are laid out to judge sensitivity.) Very lightly turn the drum of the detector to find another contact, finally substituting one of the two other points which works best (for detectors A and B). When the adjustment is finished, put the reversing switch in its original position, that is to say, do not touch any dials and reinsert plug F, which puts the phones back into the circuit. The apparatus is now ready to receive radiotelegraph signals. Safety arrangement: by simple rotation of the lid of the detector.

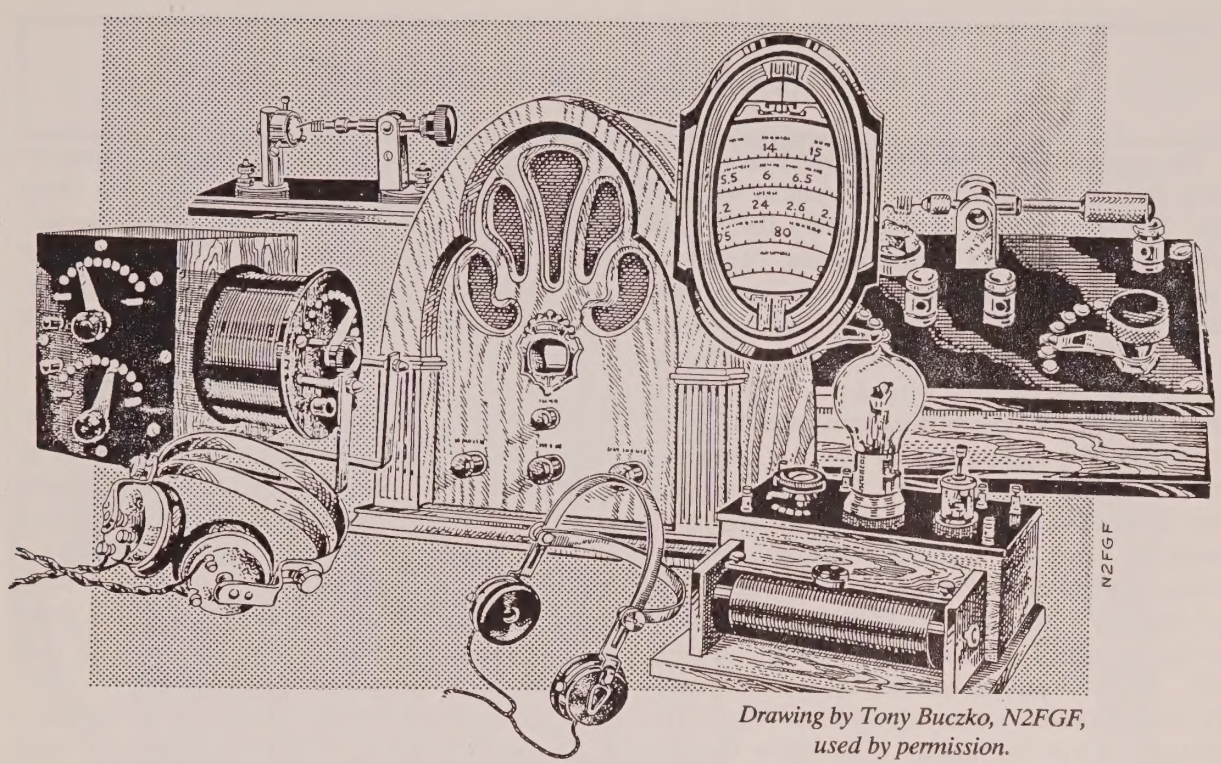
DAILY TIME WATCH

Although hourly signals permit precise obtaining of the noon hour of Paris time, one can supplement the receiver, even though it suffices by itself, with a good chronograph which facilitates observation of comparisons. For ships and other boats, it is enough that the receiver apparatus is supplemented with a good watch to navigate in complete safety.

Radiotelegraph receiver of C. Tissot and F. Pellin, without chronograph or verification apparatus, 300 francs.

The same, with verification apparatus, 400 francs.

Elegantly engraved nameplate, with antenna and ground posts above. The receiver-disconnect switch is the small plug at left.

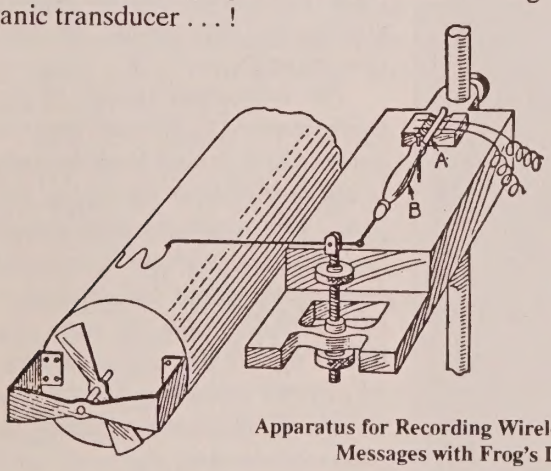


Drawing by Tony Buczko, N2FGF, used by permission.

AN OLDE-TYME WIRELESS DISCOVERY: UNIQUE WIRELESS DETECTOR FROM FRANCE

Frederick W. Chesson
144 Fiske St., Waterbury, CT 06710

"Nom d' Nom! Qu'est-ce . . . ?" Leave it to the French to come up with a detector worthy of being included in Larousse Gastronomique or other top-flight gourmet cookbooks. Indeed, it might well have required the services of a Guide Michelin five-star chef to prepare this most interesting organic transducer . . . !



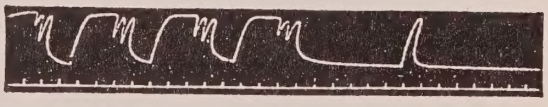
Apparatus for Recording Wireless Messages with Frog's Leg

From the February, 1913, issue of *Popular Mechanics* (pp. 231-32) comes this state-of-the-art device; "*Le Detecteur Francais Cuisse d' Grenouille*" - the French frog-leg detector!

We owe it all to one Charles Lefeuvre, physiology professor at Rennes University in Brittany. He continued Galvani's classic investigations of a century earlier into the electro-biological qualities of genus Rana, and discovered a truly remarkable application for the new Age of Radio.

According to the diagrams and text, the output of the receiver is connected to the (detached) lower leg's sciatic nerve. One end of the leg being firmly clamped, the other is connected to the end of a pivoted recording pen, so as to inscribe on a moving strip of smoked paper any muscle motion excited by the signal.

Results seem impressive, as the record clearly shows the Morse code letter "D," received three times from a time-signal transmitter atop the Eiffel Tower in Paris, 230 miles away!



Record of Time Signal, 10:47: One Dash, Two Dots, Repeated Four Times, and One Strong Impulse at the Exact Minute

Technicians may insist that the participation of *Le Petite Grenouille* was that of transducer, rather than as a detector - and not a long-active one, at that. Yet, given enough RF amplification, M. Rana's leg might well have responded to CW signals of up to five WPM, if not faster. *Mais oui*!

Whatever its inherent limitations, the system still rates as the only known wireless device which the operator could have eaten (preferably sautéed with garlic) at the completion of his shift.

ANOTHER RADIO TIME RECEIVER

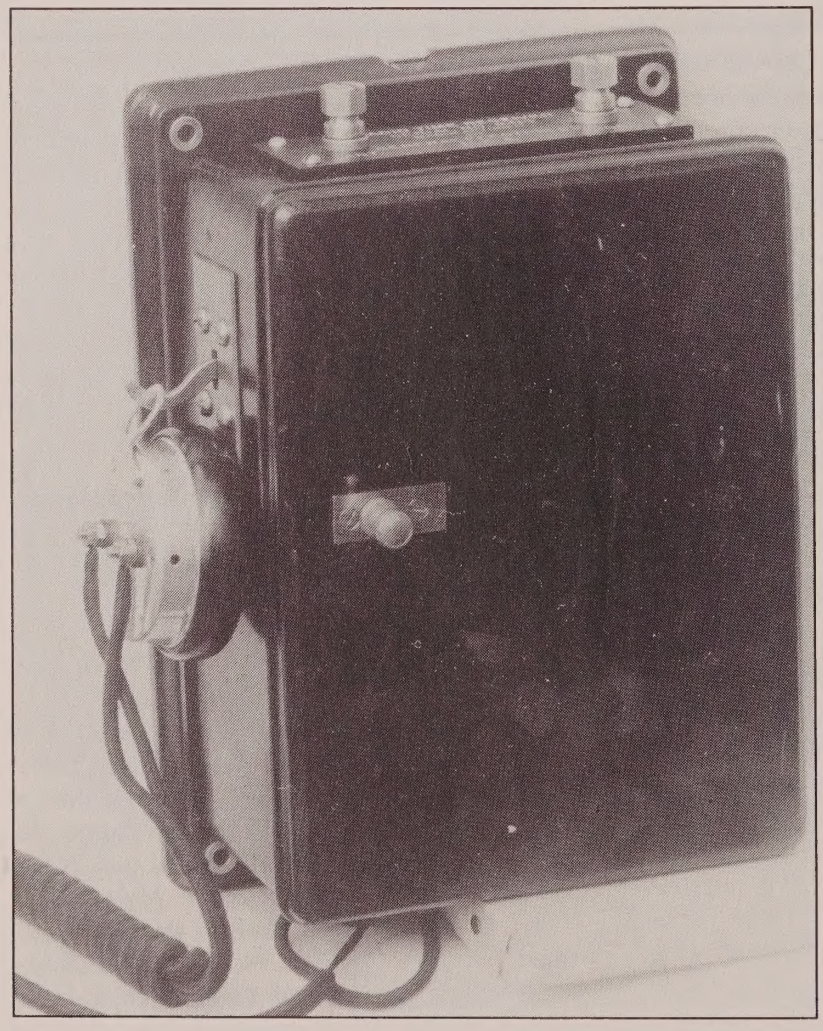
The reception of time signals by radio was an early, widespread application of wireless technology. In the early part of the century there were several groups of users of time signals. Railroads had to synchronize the clocks in their stations. Their needs were well served by the wireline telegraph facilities that handled normal train dispatching - a time tick over the wire at noon was sufficient. By contrast, radio was indispensable to ships' navigators, who had a pressing need for daily corrections of their chronometers. Naval Observatory time from NAA on 2500 meters (120 kHz) was useful all along the Eastern Seaboard. Watchmakers needed clock corrections, too. They could get them by subscribing to Western Union time service, in which a leased wire brought in time ticks. But WU service was not cheap, and "jewelers' time receivers" were a common item in the products of wireless makers - see Alton DuBois' story on a loose-coupler jeweler's set for receiving NAA in the August 1991 *OTB*, p. 32.

Another user of time service, not so obvious, was electric power companies. As operators of interconnected generating stations, they were (and still are) critically interested in the "system frequency" as an indicator of proper network operation - long before their customers widely used electric clocks.

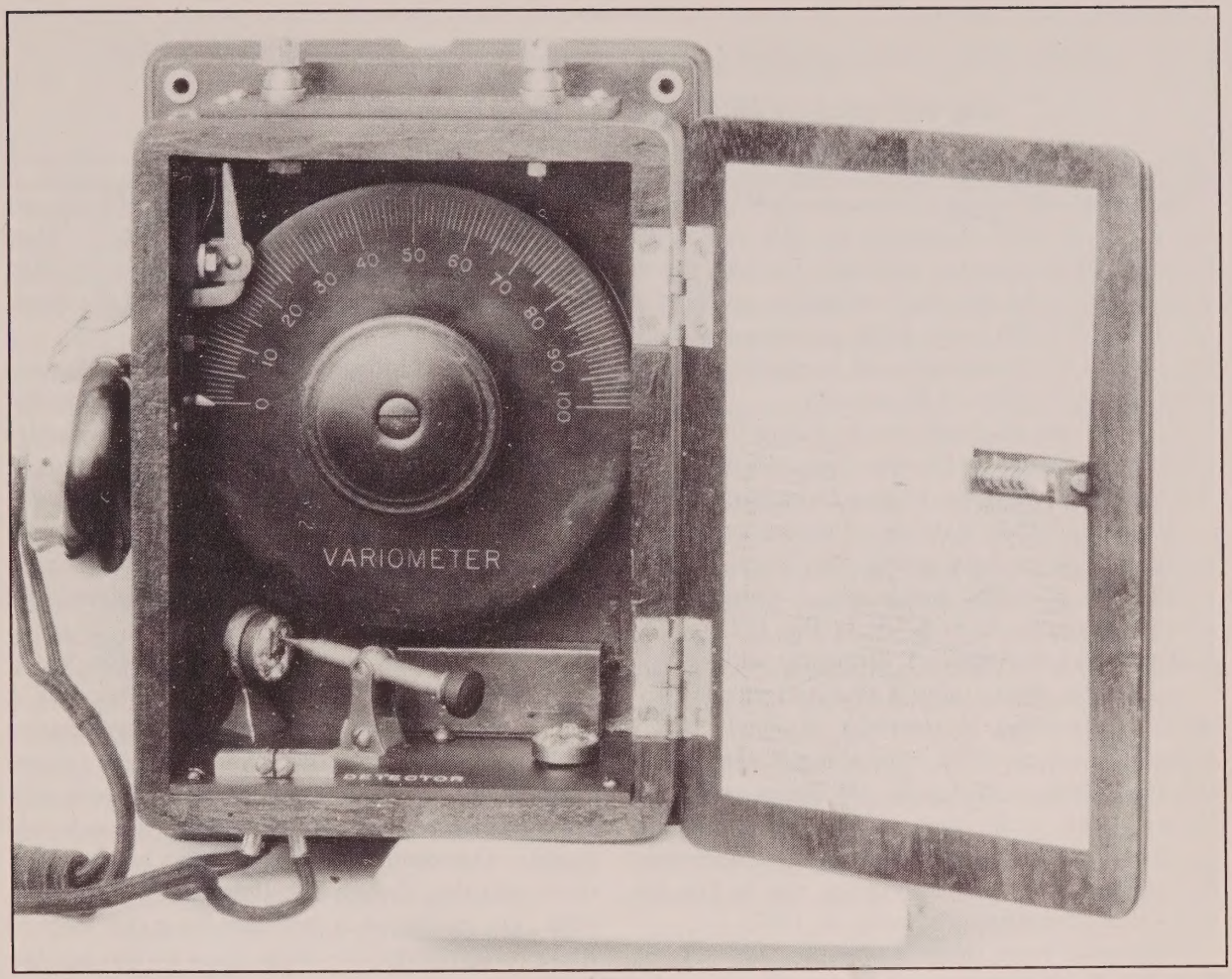
The photos of a 1921 "Radio Time Receiver" come to us by courtesy of John Anderson, who located them in the GE photo collection of the Hall of History Foundation in Schenectady. The nameplate atop the set reads RADIO TIME RECEIVER - SERIAL NO. 8414 - MANUFACTURED BY GENERAL ELECTRIC CO. - U. S. A. This appears to be a simple inductance-tuned receiver with the classic galena detector, housed in the type of casing that was widely used for wall telephones. (What a great ergonomic design: non-"wireless" users were highly familiar with phones in this shape, so picking up the receiver and listening was perfectly natural. No "mystique of radio" here!)

The operating instructions inside the door read:

This receiver is designed for the reception of time signals by radio on wavelengths between 1500 and 3000 meters with an average small antenna. These instructions apply particularly to reception from the Naval radio station at Washington, D. C., whose wavelength is 2500 meters. Time signals are sent from the station daily at noon and at 10:00 pm. The preliminary signals start at 11:55 am and at 9:55 pm, all Eastern Standard Time. The exact signals transmitted during the five minute period are shown on the chart below [the polar clock-face diagram lightly visible in the photo of the opened set].



The instrument should be securely fastened to the wall, and the antenna and ground leads brought to the terminals at the top of the case. The telephone cord should be inserted through the hole in the bottom of the case and secured to the terminals inside the case. To receive signals, first adjust the crystal detector by moving the point to various positions and adjusting the pressure by turning the knob, until a sensitive adjustment is found. Then adjust the variometer for maximum signal. The variometer adjustment may be left indefinitely, but the detector will probably require readjustment occasionally. Two kinds of crystals are provided. The outside ones are sensitive but lose their adjustment. The center



one is not sensitive but it retains its adjustment. Keep receiver on hook when instrument is not in use, as this automatically grounds the antenna, protecting variometer and also detector.

Inspecting the photo closely shows that, sure enough, the crystal mount contains one large crystal in the center, surrounded by six small ones of a different color. The detector mount is designed like a piece of jewelry!

John also copied a page from the instruction manual for a early pendulum master clock (Warren Type A). It contained a second, electric, movement for regulating the frequency of a power station by comparison with the pendulum clock. The powerhouse operator was to adjust engine speed "three or four times an hour, depending of course upon load conditions." To quote:

The best way to get the correct time is by wireless. Signals are sent out each day from Washington, starting at 11:55, continuing for five minutes. There is an interruption of five seconds at the end of each minute, with the exception of the last, when the interruption is for ten seconds. The wave length of these signals is rather long but an outfit costing less than $100.00 will receive them very well. If the wireless signals from Washington are not available, the next best method is to get the time by means of telephone or telegraph from some astronomical observatory or from the Western Union Telegraph Company at noon.

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Distributors of All Prominent Makes:—

De Forest, Wireless Specialty, Murdock, Grebe, General Radio, Clapp-Eastham, Brandes, etc., etc. Largest and Best Stock of any House in New England.

For real prompt delivery send us your orders. For Honey-Comb Coils, Unit Panels, Vacuum Tubes, Baldwin Telephones, Murdock 55's, Grebe Developments, etc., etc.

F. D. PITTS CO.

Dept. C.

12 PARK SQUARE BOSTON, MASS.

TYPE RS-100 JEWELERS TIME RECEIVER

PRICE $25.00

A one-tube jeweler's set, from *Radio Amateur News*, October 1919.

"18 DISTANCE CRYSTAL SETS" - THE RETURN OF MODERN RADIO LABORATORIES

Ludwell Sibley

Many real and future oldtimers in AWA remember Modern Radio Laboratories, the mail-order house in California that specialized in kits, literature, and parts for the small-set builder and hobbyist. For almost 50 years, MRL promoted an endless variety of crystal sets and one-tube regenerative receivers. Well, MRL is back!

The firm was originally run by Elmer G. Osterhoudt, ex-6NW. He was a product of YMCA radio school ca. 1919, a Navy "radio mechanic," then a radio operator on Standard Oil tankers along the Pacific Coast and a radio repairman. (Sure enough, there he is as 6NW in the 1921 Callbook, in Los Angeles.) Struggling with a small radio-repair shop in Oakland during the Depression, he started a tiny mail-order business ca. 1932, advertising in the classified sections of *Popular Mechanics* and other experimenter-oriented magazines. MRL accompanied him through a series of apartment addresses through the years. The company was in Garden Grove until Osterhoudt's death, ca. 1987.

BUSY HANDS WITH MRL PLANS

The firm's basic product was the "No. 2 Long Distance Crystal Set," a simple but ingenious design with an old-fashioned tapped tuning coil, primary and secondary tuning capacitors, and a galena detector. It was promoted with endless testimonials from users reporting DX reception of 500-1000 miles in the AM band, transoceanic on short wave. MRL offered instructions for building a wide variety of other crystal sets - it's amazing how many variations are possible - all trying to resolve the unsolvable conflict between selectivity and loud volume. Most of these are covered in "18 Crystal Set Circuits," MRL Handbook HB-25, and "20 Crystal Set Circuits," Handbook HB-17. They frequently rely on a built-in wavetrap, the "QRM Coil," to suppress the most offensive of the interfering signals.

MRL offered information and parts for all manner of crystal detectors, devoting two "handbooks" to the subject. Covered are the detectors of the early days - bornite, carborundum, cerusite, chalcopyrite, galena, iron pyrite, molybdenite, etc. (Little matter that Sylvania's 1N34 germanium diode, announced 47 years ago this month, obsoleted the whole lot!)

Another perennial MRL offering was a one-tube AM-SW receiver. This was a conventional pentode-based regenerative set, of the kind that brought delight to generations of young experimenters. Its "unique selling proposition" was coils wound on thin celluloid forms - Osterhoudt took used tube bases, fitted them with thin sleeves of celluloid, and wound the coils. (In reality, what one uses for a coil form in these receivers matters little. In a crystal set, the coil is so heavily loaded by the source resistance of the antenna and the load resistance of the headphones that high "Q" is unattainable. In a regenerative tube set, turning up the regeneration cancels out the losses in the coil no matter how good or bad it is.)

In the mid-Fifties, MRL added one-transistor radios to their line. Many of these were based on the now-collectable CK722 transistor, or "TRX" in MRL terms. (No problem for builders today: just wire a 2N2222 into the circuit and reverse the bat-

MRL ADS OVER THE YEARS

INSTRUCTIONS 18 Distance crystal sets - record 2100 miles; "Radiobuilder," year, 25¢. Laboratories, 151-C Liberty, San Francisco. *(Popular Mechanics*, July 1936)

REVISED Plans 18 long distance crystal sets, including "Radiobuilder" - 25¢. Laboratories, 363-C Hampton, Hayward, Calif. *(Popular Mechanics*, Sept. 1944)

"**RADIOBUILDER**" - Parts, data. Sample 10¢. Laboratories, Box I-t, San Carlos, California. *(Popular Science*, Oct. 1946)

24 PAGE Plans "18 Crystal Sets" (SW record 5,800 miles) 25¢, including "Radiobuilder," catalog. Laboratories, 1131-M Valota, Redwood City, Calif. *(Science and Mechanics*, Oct. 1952)

24 PAGE Plans "18 Crystal Sets" (SW record 5,800 miles) 25¢, including "Radiobuilder," catalog. Laboratories, 328-T Fuller, Redwood City, Calif. *(Popular Science*, Sept. 1954)

15 DISTANCE ONE-TUBE Plans - 25¢, with Transistor experiments, catalog. Laboratories, 1131-K Valota, Redwood City, California. *(Electronics Illustrated*, June 1960)

"**DISTANCE CRYSTAL SET CONSTRUCTION**" Handbook - 50¢. "Coil Winding" - 50¢. Catalog. Laboratories, 12041-L Sheridan, Garden Grove, Calif. 92640. *(Popular Electronics*, Jan. 1969)

BUILD Distance Crystal Sets. 10 Plans 25¢; 18 different - 50¢; 20 different - 50¢. Catalog. Laboratories, 12041-G Sheridan, Garden Grove, Calif. 92640. *(Elementary Electronics*, March-April 1970)

(Continued on p. 22)

BRITISH CRYSTAL SET REGISTRATION NUMBERS(1922-1924)

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British crystal sets made in the early 1920s are increasingly sought-after among U. S. collectors. The wide variety of models and the generally high workmanship contribute to their appeal. Sets made between 1922 and 1924 are of special significance, since this was the period of the infamous Post-Office registration scheme. After a brief review of the Post-Office regulations, the author provides a listing of crystal sets registered during this period, as an aid to collectors.

In November, 1922, regulations were put into effect in Great Britain requiring that all commercial wireless equipment (including such components as valves and loudspeakers) offered for sale to the public must be made by a British company. This arrangement was largely designed to protect, for a period of two years, the capital risked by member companies of the newly formed British Broadcasting Company. In this way members could be assured that, temporarily at least, they would face no competition from foreign-made wireless apparatus, particularly from Germany and Austria where manufacturing costs were much lower.

The General Post-Office (GPO) was the government body regulating broadcasting in Britain at this time. As part of this scheme, all equipment had to be tested and approved by the Post-Master General. After a set had passed the test, it was sealed and returned to the maker, who was charged with its safe keeping and required to make no design change without *". . . sanction being obtained from this Office."*

Each approved receiver was given a GPO registration number and had to be marked with a "BBC" stamp including the words "Type Approved by Post Master General," indicating that the set had indeed been made by a member of the British Broadcasting Company.

Licenses were required for broadcast listeners and, in the case of commercially made receivers, were issued only for use with BBC-approved equipment. Condition No. 2 on the reverse of the license stated ". . . *Any receiving set, or any of the following parts, namely: amplifiers (valve or other), telephone head receivers, loud-speakers and valves, used under this license must bear the mark shown in the margin.*" The "mark" was the BBC stamp.

The price of all such approved equipment included a royalty which, in addition to the listener's license fee, provided the BBC's only source of revenue. For crystal sets, this royalty was initially seven shillings, six pence (£0.375), but was reduced to one shilling (£0.05) in October, 1923. Bearing in mind that the cheapest receivers could be purchased for less than ten shillings (£0.50), the early royalty was a considerable sum.

For valve receivers, part of the testing procedure was to establish that - in circuits using reaction (regeneration) - oscillations were not generated in the aerial which could interfere with neighboring sets. For crystal receivers, the test was primarily to ensure that the set could tune over the "Broadcast" band, namely 350-425 meters or 670-860 kHz, using "standard" aerials of 30 and 100 ft in length.

The Post-Office tests were certainly not used as a quality-control procedure, as is evident from the construction standards of some sets to be approved! Also, the meaning of the Post-Office approval for components is unclear, other than the fact that they were of British manufacture.

In any event, the scheme was short-lived and came to an end in July, 1924. Although receivers still had to be British-made, they could now be sold by companies which were not members of the BBC. At the same time the Post-Office testing procedure was eliminated. Certain manufacturers continued to use the BBC stamp, mostly for prestige value, but it was no longer mandatory.

The effectiveness of the registration system as implemented is open to much debate, but, unintentionally, the scheme has provided present-day collectors and historians with a ready-made cataloging system! The numbering system was subdivided into several "series" and does not seem to follow any definite rule; crystal sets appear to have been classified primarily in the three-digit "hundreds" series, although many appear in the "four thousands" and a few in the "five thousands." The "two thousand" series contains mostly two-valve receivers, while the majority of the "three thousands" are one- and two-valve amplifiers. In some cases registration numbers in the hundreds series have a preceding zero; it is unclear, however, if this was a separate series or merely arbitrary.

It is unfortunate that no official Post-Office records have survived, or at least have been discovered. The following list of crystal-set registration numbers has been assembled by the author from several sources. Part of the interest surrounding the numbering system are the occasional anomalies: different models with the same number and the same model produced by multiple manufacturers, sometimes with the same number, sometimes not. The many gaps in the sequence are also mysterious.

The author is particularly indebted to Pat Leggatt of the British Vintage Wireless Society, who provided much of the data, for his kind permission to make use of the information in this article. Although it cannot be claimed to be exhaustive, it is hoped that the compilation will prove useful to that special breed - the British crystal set enthusiast.

REFERENCE: *Amateur Wireless and Electrics*, Vol. II No. 46, pp. 531-532, (April 21, 1923).

COMPANY	MODEL	GPO NO.
Abbey Industries Ltd.	Abbiphone Type CRO	492
Amplifiers Ltd.	Astrophone	410
Associated Wireless	Little Casket	110
Associated Wireless	Scout?	391
Bassett Lowke Ltd.	Oracle (enclosed)	270
Bassett Lowke Ltd.	Oracle (open)	270
Belling & Lee Ltd.	Belling-Lee	455
Birmingham Wireless Co.	Gledallphone	345
Bower Electric Co.	No. 1	126
British L. M. Ericsson Mfg. Co. Ltd.	0/1002	280
British L. M. Ericsson Mfg. Co. Ltd.	0/1050	5228
British Thomson-Houston Co. Ltd.	B. T. H. Model A	106
British Thomson-Houston Co. Ltd.	B. T. H. Bijou	861
British Thomson-Houston Co. Ltd.	Type C, Form B, No. R	651
Broadway Radio Works	Type A	263
Burndept Wireless Ltd.	Ethophone Junior	113
Burndept Wireless Ltd.	Ethophone No. 1	114
H. D. Butler & Co.	No. 111	118
C. T. Ltd.	Triumph No. 1	419
CA	Mk. V	255
Cable Accessories Co. Ltd.	Revophone	349
Cable Accessories Co. Ltd.	Revophone	669
Cinechrome Instruments	Cincho	384
City Battery and Wireless Co.	Cee Bee Model No. 3	249
J. S. B. Clarke	Crystal Set	342
J. S. B. Clarke	Crystal Set	347
Clyde Electrical Co.	Clydelco	871
W. H. Collins & Co.	Priorphone	875
Collins & John Ltd.	Amplex	4545
J. A. Coomes & Co. Ltd	Coomes	185
Davenport Wireless Co.	Davenport	900
Drake and Gorham	Crystal Set	191
Eagle Wireless Supply Co. Ltd.	Chakophone No. 3	332
Edison Bell Ltd.	Crystal Set	516
Edison Bell Ltd.	Crystal Set, Type B	615
Edison Swan Electric Co. Ltd.	Ediswan 1923B	433
Edison Swan Electric Co. Ltd.	Ediswan 1924B	4385
Electrical Apparatus Co. Ltd.	Type B 476	879
Elwell	Panel No. 11	104
Falk, Stadelmann & Co. Ltd.	Efescaphone	737
Falk, Stadelmann & Co. Ltd.	Efescaphone Benbow	669
Falk, Stadelmann & Co. Ltd.	Efescaphone No. 3	159
Fellows Magneto Co. Ltd.	Fellocryst Super	177
Forest Radio Co.	Forest Portable	827
A. G. Foulds Ltd.	A. G. F. Super Crystal Set	886
A. W. Gamage Ltd.	Crystal Broadcaster No. 1	176
A. W. Gamage Ltd.	Crystal Receiver	765
A. W. Gamage Ltd.	Crystal Set	226
A. W. Gamage Ltd.	Crystal Set	564
A. W. Gamage Ltd.	Crystal Set	584
G. H. J. Trading Co. Ltd.	Midge	902
General Electric Co. Ltd.	Gecophone No. 1	102
General Electric Co. Ltd.	Gecophone No. 2	103
General Radio Co. Ltd.	"The Rex"	142
General Radio Co. Ltd.	G. R. C. 4	132
Gordon Castagnoli	Castaphone	167
J. G. Graves Ltd.	Thameside	4542
H. E. W.	H. E. W.	639
Hammersley Bros.	Crystal Set	439
Harding, Holland & Fry Ltd.	OTB Type A	745
Hart Collins Ltd.	Crystal Set	4022
Haynor	Crystal Set	312
W. J. Henderson	BRC1	412
International Electric Co. Ltd.	IEC	160
J. R. Wireless Co.	Jacophone	5304
J. R. Wireless Co.	Jacophone	5304
J. W. B. Wireless Co. (later Brownie)	Brownie	4155
Leslie McMichael Limited	Radiomac Crystal Mk. III	237

COMPANY	MODEL	GPO NO.
Lintophone Co.	Lintophone	444
Lintophone Co.	Lintophone Junior	4012
Lisenin Wireless Company	Premierphone A	607
Marconiphone Co. Ltd.	Crystal A	101
Marconiphone Co. Ltd.	Junior	100
Marconiphone Co. Ltd.	Sterling A1	485
Marconiphone Co. Ltd.	Universal Baby	4215
Master Radio Manufacturing Co.	Master Junior	899
MEC	Crystal Set	138
Mechanical Utilities Co.	Faeritone	393
Meepon	Crystal Set (US)	4043
Metropolitan-Vickers Elec. Co. Ltd.	Cosmos Radiophone	145
Mitchells Electrical Co.	No. 1	151
Morch Bros. Ltd.	Rexophone	792
National Wireless & Electric Co.	Super	441
Nirvanax Ltd.	Duo Coupling Receiver	225
Omniaphone Radio Co.	Omniaphone	4961
Radio Industries Ltd.	R. I. XLA	122
Radio Instruments Ltd.	No. 1	122
Re-Echo Electrical Manufacturing Co.	Crystal Set	671
Re-Echo Electrical Manufacturing Co.	Crystal Set	4934
Reliance Radio Service Co.	Reliance	277
Reliance Radio Service Co.	Reliance A. 1.	665
Reliance Radio Service Co.	Reliance No. 2	277
Reliance Radio Service Co.	Reliance No. 3	302
Reliance Radio Service Co.	Reliance No. 3	373
Rooke Bros. Ltd.	Bebephone	4216
S. L. E. W. Co.	Gem	881
Saxon	Crystal Set	4059
Scottish Wireless Telephone Supplies	The Thistle	854
Siemens Bros.& Co. Ltd.	Type 125	599
Sterling Telephone & Electric Co. Ltd.	No. 1	130
H. W. Sullivan	Crystal Set	171
T. P. Brady Co.	Crystal Set	4991
T. P. Brady Co.	Crystal Set	4991
T. W. Thompson	Delaphone No. 2	4371
Telephone Manufacturing Co. Ltd.	T. M. C. No. 2	183
Telephone Manufacturing Co. Ltd.	T. M. C. No. 5	561
Thames Electric Wireless Co.	Crystal Set	817
H. C. Tolfield	Syren	460
Turner & Co.	ATM No. 48308	313
Universal Electric Supply Co. Ltd.	Claristal	901
Unknown Manufacturer	"FLB"	223
Unknown Manufacturer	A1 Radio	4216
Unknown Manufacturer	Big Ben Type 4	506
Unknown Manufacturer	Crystal Set	4121
Unknown Manufacturer	Crystal Set	5374
Unknown Manufacturer	Crystal Set	656
Unknown Manufacturer	Frazerphone	327
Unknown Manufacturer	Hammophone	748
Unknown Manufacturer	Headphone Style	4145
Unknown Manufacturer	Phonette	551
Unknown Manufacturer	Wisemanette	4147
Varoto Ltd.	Voc. 1	233
Wainwright Mfg. Co.	Crystal Set	128
Walter's Electrical Mfg Co. Ltd.	Crystal Panel	124
Ward & Goldstone Ltd.	Claristal	901
Ward & Goldstone Ltd.	Sonola Cabinet Set	315
Wates Bros. Ltd.	Bijouphone	4216
Wates Bros. Ltd.	Bijouphone	5284
Welton Wireless Co.	No. 1	269
Western Electric Co. Ltd.	44000/1	134
Wireless Co.	Crystella	4034
Woodhall-Wireless Mfg. Co. Ltd.	"All-on-Deck"	570
Woodhall-Wireless Mfg. Co. Ltd.	Woodhall	4935
Wright & Weaire Ltd.	No. 266	118
Yorkshire Radio Co. Ltd.	Spotter	5435
Zeitlin & Sons	Nos. 2 & 3	5304

EARLY EQUIPMENT PROFILE

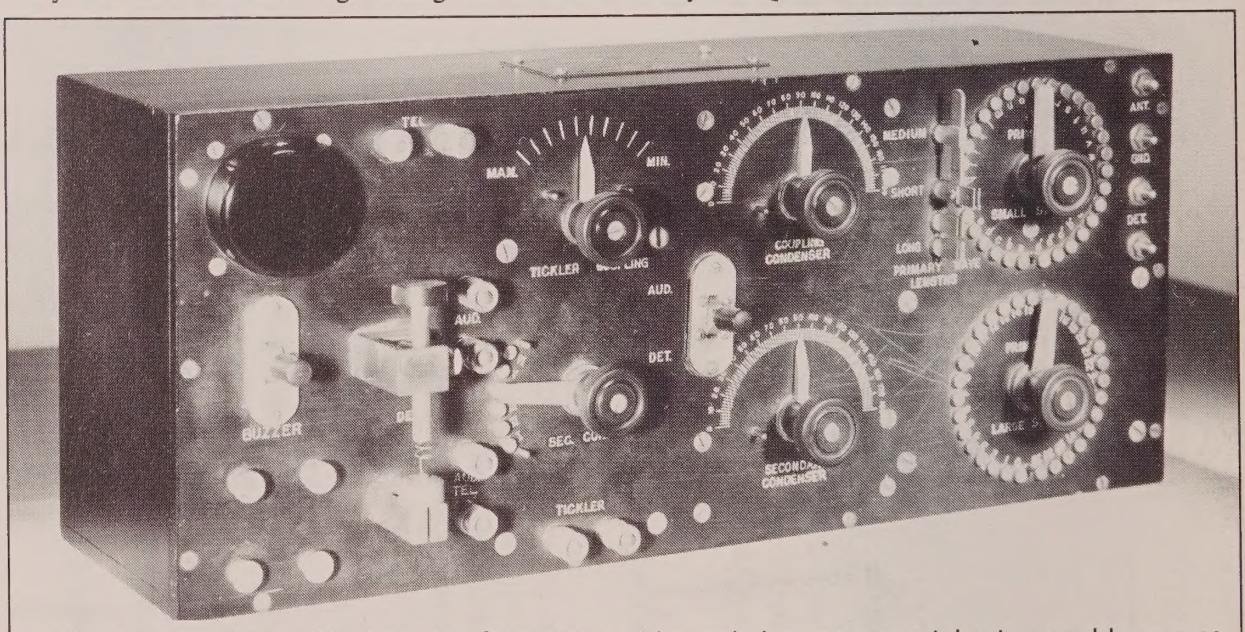
EDITED BY
LAUREN PECKHAM
Ormiston Road, Breesport, N.Y. 14816
All correspondence requires SASE for reply

THE CN-113A: A HIGH-QUALITY CRYSTAL RECEIVER

The National Electrical Supply Company had its beginnings in 1880. Fred Royce and a partner established a machine shop in Washington, D. C., doing business as Royce & Marean. They specialized in the repair of marine engines and in the manufacture of main shafts and propellers. Some electrical equipment was also manufactured. In 1899 the firm moved to a larger building and changed its title to the National Electrical Supply Company. New products included doorbells and electric lighters for gas illuminating fixtures. A large amount of business was done with the U. S. government, which purchased telegraph equipment. Soon, both the Army Signal Corps and the Navy were buying wireless gear, including transmitters and receivers. Before the arrival of WW I, the company was well qualified to produce needed radio equipment.

Several types of very compact receivers were manufactured, including the CN-113A shown in the photograph. This sample was made for the Navy's Bureau of Steam Engineering and is dated 1917. Frequency coverage is 300 to 2500 meters (120 to 1000 kHz). The interior construction is impressive, with all wiring to binding posts soldered as well as mechanically secured. Support brackets are machined from solid aluminum, pivot points for rotating coils are made of brass. Variable capacitors again use machined parts and all insulating portions are assembled with brass screws. Coil windings are shellacked along with all wiring. Fixed capacitors are mounted inside bakelite cases, secured with machine screws with nuts soldered in place. This housing is also sealed with a heavy coating of wax. The whole unit is certainly a fine example of high-quality workmanship that existed during the days before mass-produced radios appeared in the 1920s.

(For a fine description of the Navy's best known receivers of this general vintage, see Ed Lyon's "Early Navy Receivers of Note" and "Details of the Navy SE-Receivers," in the Mid-Atlantic Antique Radio Club bulletins of December 1991 and February 1992 [Vol. 8 No. 8 and Vol. 9 No. 2].)



Like most receivers of its time, the CN-113A could stand alone as a crystal set or could serve as the tuner for a regenerative audion (tube) detector. In the days when tubes were erratic and unreliable in operation, the crystal detector provided backup capability, for example, when the audion burned out halfway through a message. The built-in test buzzer (top left) was a signal generator for adjusting the detector for best sensitivity in the absence of a signal off the air.

There is room for confusion between the National *Electrical Supply* Company and the earlier (for our purposes) National *Electric Signaling* Company, the Fessenden operation. Which one is abbreviated "NESCO" often depends on context, although the earlier company should properly get the title - and is so treated in the official History of Communications-Electronics in the U. S. Navy.

CROSLEY AND THE *CROSLEY BROADCASTER*

William E. Denk
81 Steeplechase Rd., Devon, PA 19333

This long-time radio enthusiast recently relived, figuratively, the days of his youth and earliest contact with radio. My home then was in the wide-open spaces of North Dakota - far from any broadcast station. Crystal sets had been tried by some, but static was the only reward. This trip back to the Twenties began with the opening of an old file which contained some items relating to my first radio, a Crosley 52 of 1925. There I found an old copy of Crosley's 52-page booklet "Simplicity of Radio" from 1923. That, along with *Popular Mechanics* and some radio magazines, constituted my introduction to the exciting world of radio. In the same file I found a well preserved leaflet extolling the virtues of the Crosley 52 - price $30. Best of all, there was the original, four-page, 8½ x 11 inch, "Instructions for Operating Crosley 52 Radio Receiver." The latter described in minute detail, with drawings, how to connect batteries, speaker, antenna and ground for use with six-volt tubes, 199s, or WD-12s.

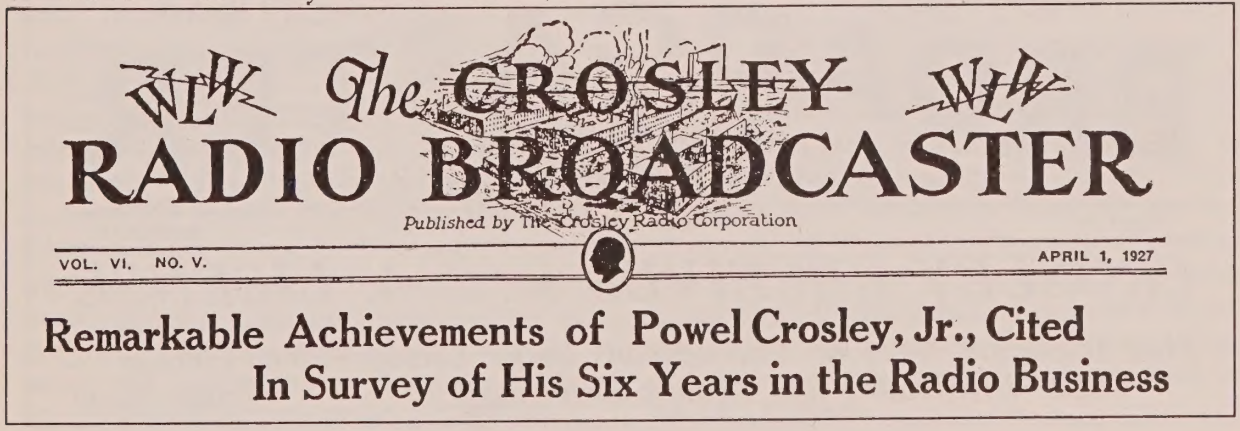
In 1927, that Crosley 52 became my first ham-band transceiver. With an SPDT switch, the plate voltage on the regenerative detector could be changed from 22½ volts, for receive, to 135 volts for transmit. A carbon-granule microphone in the ground lead modulated the carrier (two watts?) when the tickler was adjusted to the point of oscillation. With Tap 1 of the five-point tap switch I could be safely in the 160-meter ham band. That afforded many QSOs with other hams in the region. The 52 served until my license arrived in 1928, by which time it was replaced with a somewhat more respectable transmitter, based on the Hartley oscillator. My call was 9FPC, North Dakota then being in the ninth call area; the "W" was added later in 1928.

A second old file held a set (sadly incomplete) of Crosley Radio Corporation's periodical, distributed to all its dealers, the *Crosley Radio Weekly*, renamed first *The Crosley Radio Broadcaster*, and then *The Crosley Broadcaster*. The writer's set extends from October 5, 1925, to December 15, 1934, a period covering one of the more exciting times in broadcast radio. The earlier issues contained eight pages, but the publication quickly grew to 16. The *Broadcaster* covered news of Crosley itself, its products, its distributors and dealers, and the industry in general. New models were announced in this publication, along with circuit details and servicing hints.

Possession of these old gems grew from the fact that my father was the pharmacist in a small-town drug store that sold radios - Magnavox, Fada, but mostly Crosley; the latter better fit the pocketbooks of that farming community, then heading into the Great Depression. In those days it was not uncommon for small-town drug stores to sell radios because, typically, the drug store was the last to close at night. The writer soon became the local "radio expert" and repairman. In a town of 400 there was little competition!

Included in the series of *Broadcasters* were several service supplements. One was a "Service Manual," dated September 1, 1927, on the original Crosley "Bandbox," Model 601. From this publication I learned, in 1927 (then a junior in high school), how to neutralize a Neutrodyne radio. It was a great moment when I removed the heterodyne whistle from an ailing Bandbox. There was also a 24-page manual, dated October 21, 1928, loaded with general servicing information, followed by detailed service notes on the several Bandboxes, Gemboxes, Jewelboxes, Showboxes; plus the Crosley Musicones and Dynacones.

Leafing through the many issues of the *Broadcaster*, I was reminded of many milestones in Crosley history. The "hot" products in 1925 were Models 50, 51 and 52, and the Trirdyn with its three-tube reflex circuit. All survived several seasons with numerous variations in cabinetry and dials. The October 15, 1925 issue extolled the


WLW The CROSLEY WLW
RADIO BROADCASTER
Published by The Crosley Radio Corporation
VOL. VI. NO. V. APRIL 1, 1927
Remarkable Achievements of Powel Crosley, Jr., Cited
In Survey of His Six Years in the Radio Business

merits of the "quadruple-covered wire" used in the RF coils of the Trirdyn. Said the *Broadcaster*, "The extra covering makes the insulation more durable, but the chief value lies in spacing the wires of the coils farther apart, thus reducing electrical losses." The same issue had a half-page ad on the Crosley "Pup" at $9.75. Also featured there were the Crosley 51 "Special DeLuxe," the 52 SD, and the "Super Trirdyns." A full page ad on the "Musicone" announced its price cut to $14.75.

The March 15, 1926, issue carried a full-page ad featuring Crosley's five-tube RFL-60 and RFL-75, along with the four-tube 4-29 and five tube 5-38. Interestingly, for each of these models, the numbers following the hyphen revealed the selling price. Evidently, there was little fluctuation in the value of the dollar in those days! The RFL models featured a neutralizing circuit developed by Radio Frequency Laboratories, Inc. - "non-oscillating at any frequency, non-radiating, and cannot be made to howl even if mishandled." The 4-29 and 5-38 each had tickler-controlled regeneration, but here the control, perhaps in the interest of respectability, was termed the "Crescendon." Interestingly, regeneration in the five-tube 5-38 was effected by feedback, not to the detector input, but to the input of the preceding RF amplifier. Radiation was prevented by interposition of the first RF amplifier stage between the oscillating stage and the antenna.

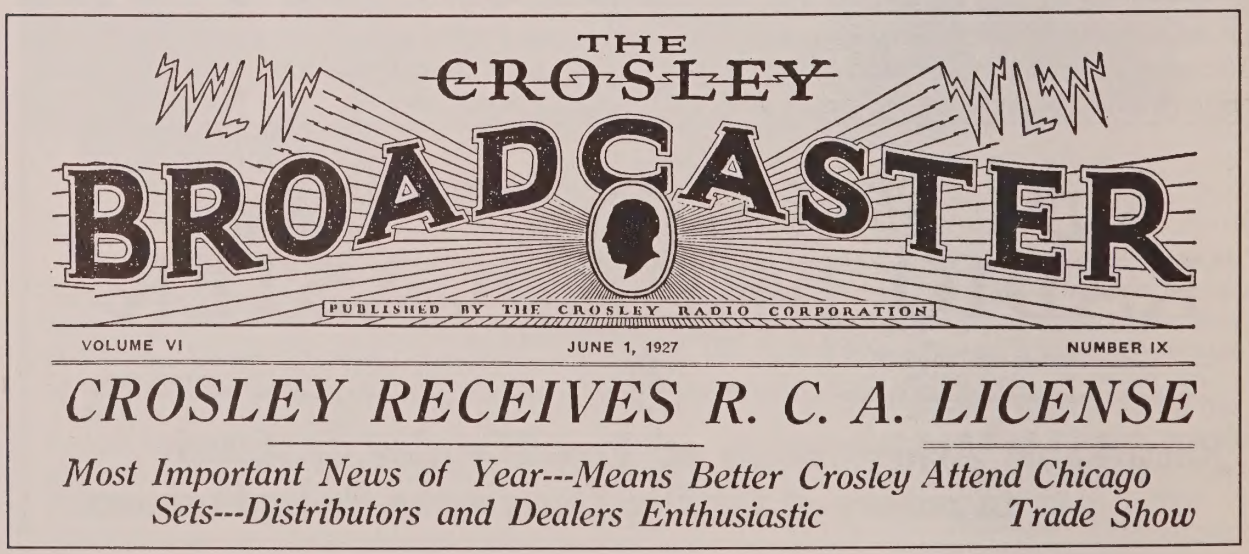
The April 5, 1925, issue described Radio Frequency Laboratories under whose patents the RFL models were licensed. These circuits were said to have been designed by Stuart Ballantine and Dr. Lewis M. Hull. That same issue, on page 4, has an illustration of an early four-tube transmitter which Crosley acquired when it bought the old Precision Equipment Company.

The Fourth Annual Convention issue, July 5, 1926, introduced the five-tube, single drum dial Model 5-50 at $50, and its console version, the 5-75, at $75. These had two tuning-gang trimmer padders adjustable by way of two levers accessible through a pair of front-panel slots, to let the operator achieve precise tracking of the three common-shaft condensers. Crosley called these "Acuminators." Sensitivity of these models was increased through the use of Crosley's old standby, the "Crescendon"-controlled regenerative detector. My recollection is that this feature was seldom needed in normal reception, but was great for DX.

The November 1, 1926, issue had an article about Charles W. Peterson, inventor of the Crosley Musicone. The article described the benefits of using a baffle with the Musicone; a 4-by-4-foot size was suggested. I tried this at the time and still recall my astonishment at the resulting improvement in the reproduction of lower notes of the orchestra and pipe organ, using my Crosley 52! The same issue heralded the coming of shortwave broadcasting toe reduce chaos on the broadcast band. It was stated that WLW, then broadcasting on a wavelength of 422.3 meters (at least they weren't using feet or yards in those days), would soon be broadcasting in the region between 10 and 100 meters. This same issue introduced Crosley's new electric sign. One of these marks the entrance to my little museum.

Introduced in the January 1, 1927, issue was the "Crosley Lowave," a three-tube short-wave converter covering the range from 20 to 80 meters. It was a two-dial instrument retailing for $40.

Crosley's first "Batteryless" radios, the AC-7 and AC-7-C, were featured in the February 1, 1927, *Broadcaster*. They were batteryless by virtue of a separate power unit that supplied the necessary A, B, and C voltages. The receivers were supplied with panel-mounted voltmeters, and the power supply with a rheostat to permit adjustment for variations in line voltage. Also appearing in this issue was an announcement of the Crosley "Merola," an electric phonograph pickup that enabled one to play phonograph records through the radio.


THE CROSLEY

WLW BROADCASTER WLW

PUBLISHED BY THE CROSLEY RADIO CORPORATION

VOLUME VI JUNE 1, 1927 NUMBER IX

CROSLEY RECEIVES R. C. A. LICENSE

Most Important News of Year---Means Better Crosley Sets---Distributors and Dealers Enthusiastic

Attend Chicago Trade Show

The April 1, 1927 *Broadcaster* afforded dealers an opportunity to acquire quantities of the old, two-tube Model 51, complete with tubes, at the wholesale price of $5.50, "cash with order"! The dealer was to set his own selling price. This offer was repeated over a period of several months. One wonders how Crosley came to have such a substantial inventory of these sets.

The April 15, 1927 *Broadcaster* had a feature article on WLW, then operating with 5000 watts on 422.3 meters (710 kHz) and on 52 meters shortwave with 250 watts. It was stated that three other broadcasters, WGY, KDKA and WABC, were also active in the shortwave band. At that time WLW's programs originated in Crosley's Plant 1 studio and were carried by wire to the transmitters at Harrison, Ohio. The same issue had an article stating that the Federal Radio Commission (remember that was pre-FCC!) was initiating an effort to clear the air of station overcrowding and heterodyne whistles.

An ad in the May 1, 1927 issue took me by surprise. It extolled the virtues of the De Forest DL4 RF amplifier tube, DL15 detector, and DL5 audio amplifier. The ad was over the name "De Forest Radio Company, Powel Crosley, Jr., President, Jersey City, NJ."

The *Broadcaster* of June 1, 1927 brought news of Crosley's acceptance of a license from RCA under its patents "on tuned radio frequency circuits." Remember, RCA was not, at that time, willing to license competitors under its patents on the superheterodyne circuits. This same issue reminded readers how WLW had kept its listeners informed on the non-stop transatlantic flight of Charles "Slim" Lindberg.

The *Broadcaster*, on June 15, 1927, noted that Crosley had also taken a license under the Hazeltine patents. Accordingly, as might have been anticipated, Crosley's next line of radios included a six-tube receiver of the Hazeltine Neutrodyne type. As described in the *Broadcaster* of July 1, 1927, this was the Crosley "Bandbox," Model 601. The audio output stage employed a UX-171 power tube. Interestingly, this set still employed a cartridge-type grid leak to be selected by the user. With strong signals, a value of one megohm was suggested, while a three-meg leak was recommended for average conditions. Volume control was effected by regulating the filament current of the three RF stages. The Bandbox still featured Crosley's Acuminators for front-panel access to trimmer condensers on the second and third interstage transformers, but the Crescendon was now a thing of the past. The Bandbox retailed for $55. A variety of console cabinets, each equipped with the Musicone, were available at $35, $65, and $85.

The *Broadcaster* of September 15, 1927 announced "The Berwick Model" of the "Royal Series," manufactured by the Amrad Corporation of Medford Hillside, Massachusetts, Powel Crosley, Jr., Chairman, Board of Directors. This six-tube upscale Neutrodyne console listed at $195 for battery operation and $295 for AC.

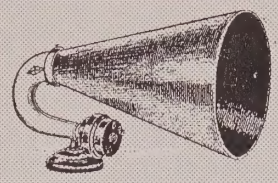
The *Broadcaster* of March 15, 1928 introduced the Crosley Jewelbox, Model AC704. This was essentially the original Bandbox engineered for true AC operation. It employed four UX-226 tubes, UX-227 detector, UX-171A power output tube, and UX-280 rectifier.

Here my *Broadcaster* file is missing about a year's worth of issues. The start of a college career in the fall of 1928 may explain the gap. But in the February 1, 1929 issue, Crosley was featuring its Jewelbox, Model 804, "an 8-tube receiver operating directly from the light socket" with push-pull power tube output. Volume control was effected by varying the value of an unbypassed resistor in the cathode circuit of the first RF amplifier. This receiver used the new Crosley Type F Dynacone, with moving armature, whose field coil served also as a choke in the set's power supply. The then-new Mershon electrolytic condenser was employed in the power supply.

The July 1, 1929 *Broadcaster* gave its readers a front-page article by Ralph H. Langley, Crosley's Director of Engineering, describing Crosley's new 40-S, 41-S, 42-S, and 82-S series of eight-tube screen-grid "Unitrad" receivers. These employed Crosley's new "Dynacoil" electrodynamic speaker employing a moving-coil system. With a pair of 245s in push-pull, I recall this as a most impressive performer.

The *Broadcaster* of April 1, 1930 featured articles on WLW; one described its transmitter, then 50,000 watts, at Mason, Ohio, and the other covered its new studios. One of the studios not only accommodated a pipe organ but could also handle a full symphony orchestra. Also featured was an article (description plus schematic) on the Crosley "Buddy" and "Chum" receivers, six-tube screen-grid sets with push-pull output.

We now reach the last chapter of this little review of Crosley's early history. It will be recalled that in licensing its competitors under its radio patents, RCA reserved to itself an exclusive right under its patents on the superheterodyne receiver. Thus Crosley and others in the Twenties were effectively limited to receivers of the tuned-radio-frequency type. Fortunately, these receivers had attained a high order of excellence, of which Crosley's Unitrad line was a good example. However, in the early '30s RCA decided to include its patents on the superheterodyne in its license package, and that essentially sounded the death knell for the TRF receivers.



THE LOUDSPEAKER

EDITED BY
FLOYD PAUL, W6THU
1545 Raymond, Glendale, California 91201
All correspondence requires SASE for reply

FIRCO HORN SPEAKERS

A May 1921 bulletin of John Firth & Co., Inc. (Firco Radio Equipment), 18 Broadway, New York, announced the "Vocaloud" horn speaker. Two styles were advertised: a laboratory type, which consisted of a bell and neck unit mounted on a vertical laboratory rod stand and anchored by a heavy metal base; and a station type, which was a neck and bell mounted in a mahogany cabinet with two protruding terminals on the lower right side of the box. Dodge Sound Amplifiers, Inc., of Mount Vernon, New York, made wood-pulp composition horns for radio, railroad, public-address and phonograph applications; and made the horn and bell assembly for John Firth.

Most of Firth's advertisements offered a Baldwin earphone with mica diaphragm. (The author's audio test of Baldwin earphones was reported in "Nathaniel Baldwin Earphones" in this column of the *OTB*, Vol. 24, No. 3, Dec. 1983. The frequency-response curve shows that Baldwin C earphones had a pronounced resonance in the 900-Hz region.) Later an ad offered a Vocaloud, type 1, mahogany cabinet with a special Brown phone, having an adjustment knob on top of the cabinet.

The advertisements claimed that the sound chamber of the neck and bell were shaped like a human ear. A half-page article on Vocaloud with a cutaway view of the earphone is printed in the August 1921 issue of *Radio News*. The notation that no batteries, no adjustments and no extra equipment were required was a "dig" at Magnavox, which was a giant advertiser in those early years.

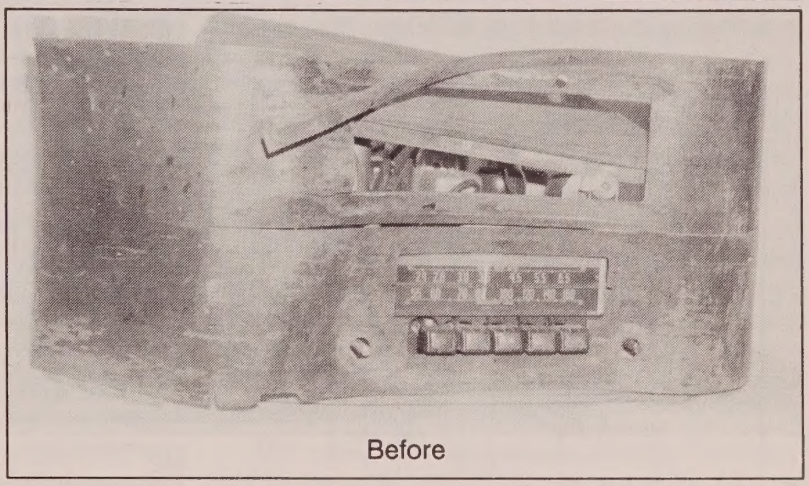
A. H. Corwin and Company in Newark, New Jersey, soon became an authorized retail outlet for J. Firth and Co., Inc, as did the Shepard Stores of Boston. Typical of many early ads by John Firth using the trade name Firco Radio Equipment was a full-page insertion in *Radio News* of September

(Continued on p. 54)

SAVING A CROSLEY 628

Alton A. DuBois, Jr.
67 Peggy Ann Rd., Queensbury, NY 12804

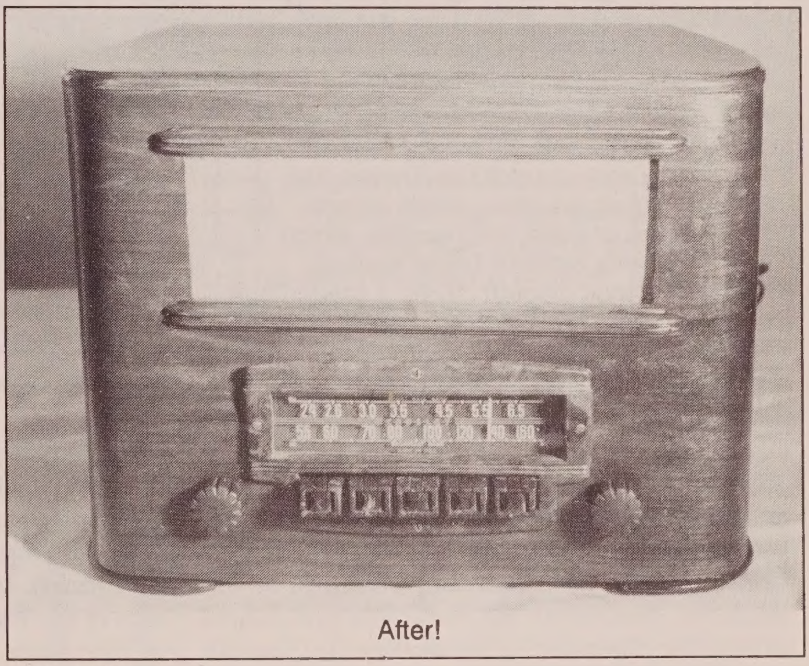
Some months ago, I visited a local junk shop where I found this little Crosley radio that had been left out in the rain for weeks. The veneer was all loose and the top was detached, as was the trim. Otherwise (!) the set looked OK from top to bottom, so I blew $3 on it.



Before

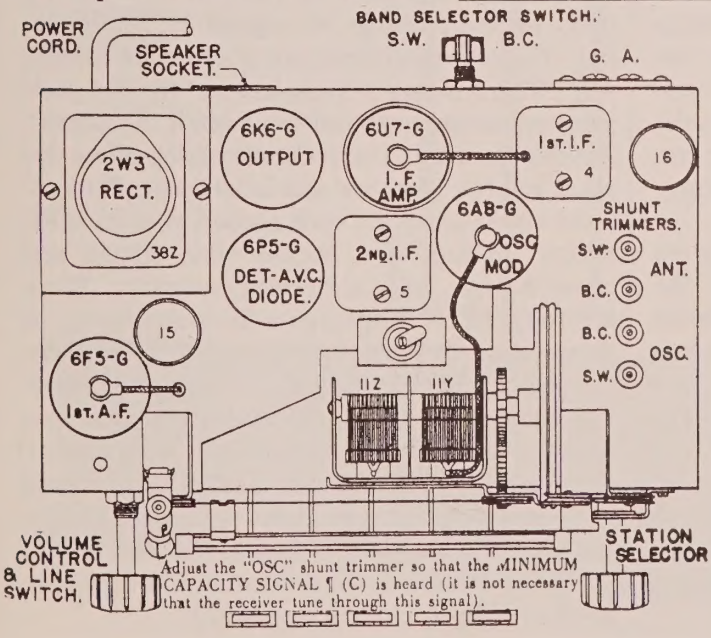
After getting it home and checking it out, I found the veneer was not salvageable and only the top and bottom boards were usable; both had a recess where the veneer fitted.

The chassis was in good shape, except that the wet electrolytic was bad. To fix it, I removed the top cap and replaced the innards with a new axial capacitor of the same value ("Restoring Wet Electrolytics . . . ," May 1992 *OTB*, p. 32). A coupling capacitor was shorted. Its paper casing was easily removed with a little hot water to soften it, and I fitted it over the body of the replacement. The volume control was noisy and could not be cleaned, so I replaced it.



After!

After realigning the RF section, I set the chassis aside for work on the cabinet. That was the toughest part of the job. First, I made a new pine carcass for each side that would allow the chassis to fit, and glued the top and bottom to it. Fitting and trimming to get the right shape and size, the veneer was a problem to bend without cracking. I soaked a piece of poor-quality birch veneer in hot water and, with many clamps and wedges, shaped it onto the carcass without glue, until it set up dry. A cabinet maker had taught me to preform the veneer before gluing - it saves taking off mistakes. I then repeated the process with a piece of good walnut veneer.

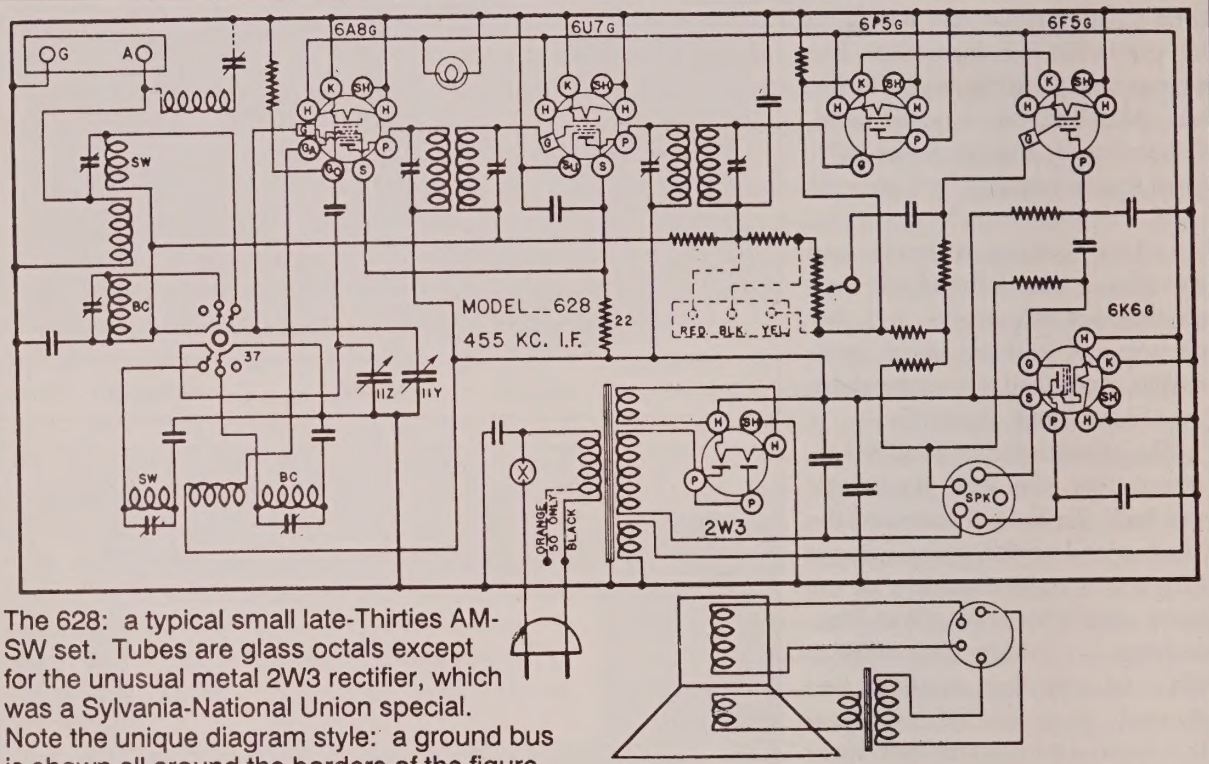


The front part of the carcass was precut for the speaker and dial opening. I had the chassis in and out of the cabinet many times, getting the right positions for the dial and speaker and the shaft lengths. T'ain't easy.

With all the cabinet work complete, I sand-

ed and stained the finish. The trim on the speaker opening is molded basswood, stained to suit. Dial trim is brown plastic. The grill cloth is original.

The set plays very nicely and looks good. My wife said I was crazy to go to so much work, but resurrecting the dead is a challenge. The set had no model number on it, only "Crosley" on the dial. I sent a drawing of the tube layout to Alton Bowman, my diagram supplier (see *OTB* want ads or *A. R. C.* for address). He researched and found the circuit diagram, the date (1937), and the model number (628).



The 628: a typical small late-Thirties AM-SW set. Tubes are glass octals except for the unusual metal 2W3 rectifier, which was a Sylvania-National Union special. Note the unique diagram style: a ground bus is shown all around the borders of the figure.

(Continued from p. 12)

tery and the electrolytic capacitors!)

MRL literature took many forms: a quarterly magazine (*Radio Builder and Hobbyist*), the handbooks, Data Sheets, Detail Prints, etc. All were hand-composed by Osterhoudt, written in an enthusiastic, down-home but terse style that is hard to describe. Sprinkled in are small stories from his experiences as a spark operator. MRL writings might lack scientific precision, but they were certainly enjoyable. The sales catalog offered literature, complete kits, and parts. Besides the regular listings, the catalog offered a jumble of other parts, new and used; old magazines, etc. - a sort of mail-order flea market.

As an art form in its own right, MRL literature became collectible; a few AWA members like Frank White have amassed files of it. Dexter Deeley recalls talking with Osterhoudt some years ago - he seemed friendly and enthusiastic, and talked of having a vast amount of radio material on hand to support the business.

The firm was bought a couple of years ago by Paul Nelson of Minneapolis and is back in operation. The new catalog, 24 pages in 8½" x 11" format, costs $2, from Modern Radio Laboratories, PO Box 14902, Minneapolis, MN 55414.

The literature part of the reissued catalog is pure Osterhoudt, updated only where necessary. It lists a sweeping variety of his writings: 15 Handbooks (5-½" x 8" size), three "Detail Print Files" (8-½" x 11" format), six collections of Data Sheets, five issues of the *Radio Builder and Hobbyist*, two issues of *Electronics and Science*, etc. These are effectively second printings of original 1945-61 material. The individual items are priced quite reasonably. There is also a "complete set" for $34 postpaid, amounting to almost two pounds of material. Besides literature, the updated catalog offers the No. 2 and No. 74 crystal sets in kit form. Parts offered are basically the stuff needed to build MRL radios: magnet wire, hookup wire, crystals and crystal holders, coils, and tuning capacitors. There are replacement diaphragms for headphones, in three sizes. Besides construction supplies, there are replacement capacitors, dial lights, and about 900 types of tubes (some priced higher than Antique Electronic Supply, some lower, some relative bargains). There are even MPF102 N-channel junction field-effect transistors for replacing 01A and WD-11 tubes (see the June 1992 *OTB*).

Thanks are due to Gerry Vassilatos for pointing out the emergence of the new MRL!

MODIFIED ANTIQUE RADIOS

D. K. Owens
478 Sycamore Drive, Circleville, OH 43113

Most antique-radio collectors have encountered sets which have been modified from their original design. Before rejecting them from our collections, I think we ought to consider the nature of the modification, when it was done, and why. With a bit of imagination, modified sets can tell an interesting story, but first, some background observations.

The modifications I have seen fall into three general types. *Type 1* results from ignorant tinkering, and deserves no further discussion. *Type 2* is a modification done by a skilled craftsman with a definite purpose - usually to correct a basic design defect. These modifications were made shortly after the set was purchased, using contemporary parts. These changes improved the set's performance and could have been used in the original design, had the maker wanted to.

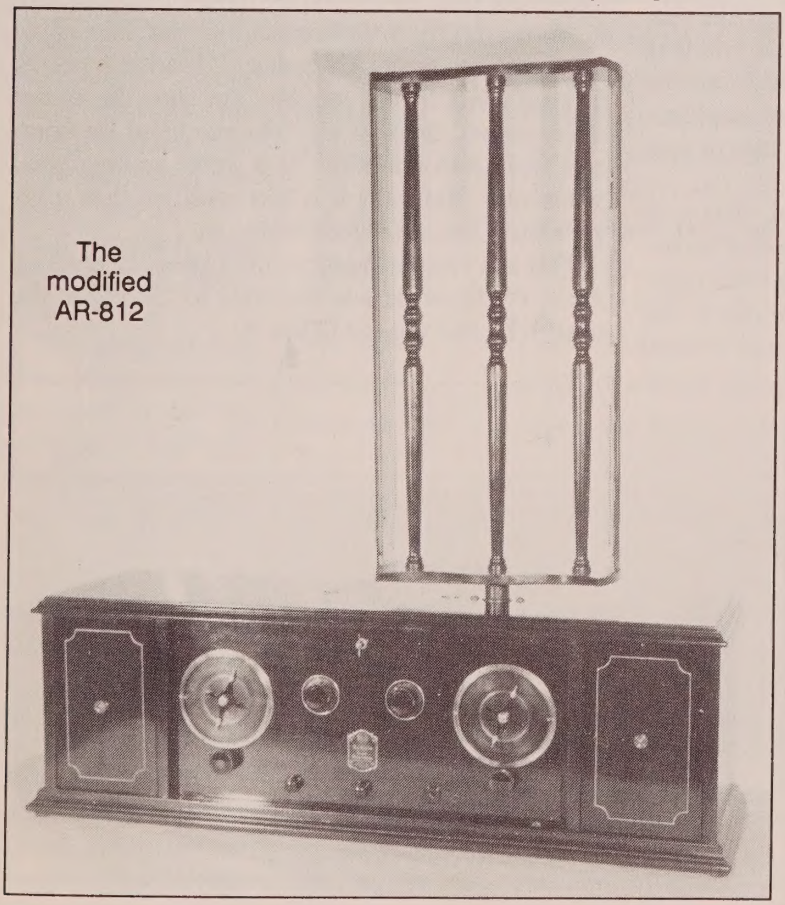
A third type of modification, such as rewiring an antique set to use modern tubes, does not correct a design defect and is not contemporary. It could not have been done in the original design and construction because the parts were not available at the time. This sort of modification may require great skill and may improve set performance, but I think it spoils the collector value of the set. I believe that *Type 2* modifications don't necessarily devalue a set, and will illustrate this view with two examples.

The first is the 1924 RCA AR-812 shown in the photo. It is an early superheterodyne using six UV-199 tubes and runs off dry-cell batteries stored in the compartments at each end. What's unusual about this picture?

Yes, that's a rotating loop antenna sprouting from the top of the set! Definitely not original. One of the big selling points for this receiver was that it did not need an external antenna. It featured a loop antenna on a box form inside the cabinet, so why add another one?

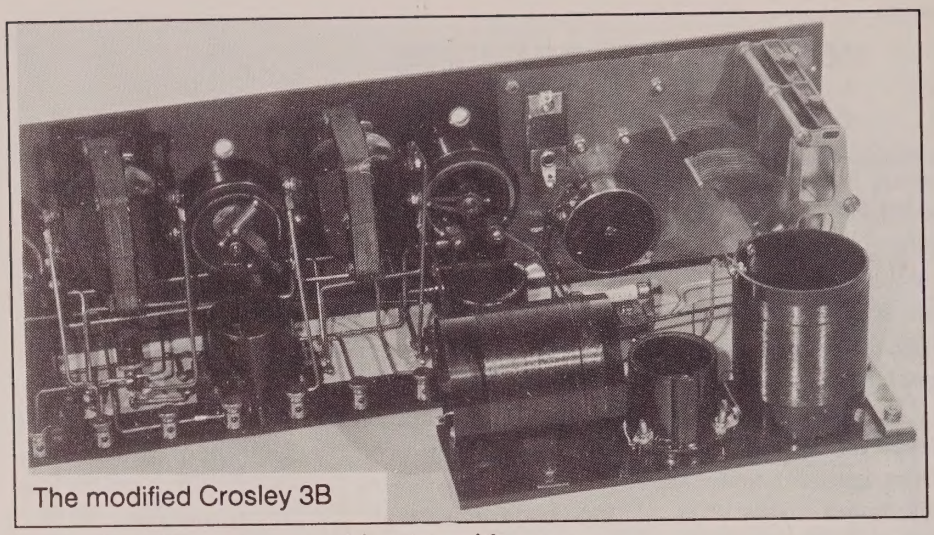
The AR-812 weighs 40 lb. without batteries. Add 15-20 lb. for two 45-volt "B" batteries, six 1.5-volt "A" cells and a 4.5-volt "C" battery, and this set weighs 55-60 lb. RCA advertised it as "semiportable" and put a leather handle on top to prove it, but trying to lift it was asking for a hernia. It was impossible for the wife, yet the set could not stay in one place. It had to be moved frequently.

The original internal loop antenna is an idea which may have looked good on the drawing board, but didn't work out in practice. It is extremely directional, so that the whole set has to be picked up and oriented toward the incoming station for optimum reception. Imagine having to lift a 60-lb weight every time you change stations!



The modified AR-812

To cure the problem, a loop antenna was installed in a rotating socket in the top of the cabinet. This antenna and socket are the same as used on the 1925 Radiolas 25 and 28. RCA must have been aware of the original deficiency because they put rotating loops on their 1925 superhets. In the operating manual, RCA also suggested the use of the AG-814 table-top loop antenna for those who "don't want the inconvenience of moving the set." They may have sent out a factory bulletin suggesting the antenna change and furnished a kit to do it. We know RCA offered retrofit kits because, when the UX-120 "power" amplifier tube was introduced late in 1925, RCA sold an adapter (UR-556) to permit its use in place of the last UV-199 in older receivers. The set pictured here also had the adapter. The owner obviously kept this set up to date,



The modified Crosley 3B

but preferred not to clutter his table with a separate antenna. I would like to hear from any reader with information on early RCA retrofits.

This modification made a nice, easy-to-use receiver out of a real back-breaker. The set could be placed wherever the owner wanted it and left there. The modification meets all the criteria of a *Type 2* modification. The loop antenna also adds to the historical interest of the set.

The second example of a *Type 2* modification is a 1923 Crosley 3B. The inside of this set is pictured on this page. Note that the "book" condenser, spider-web coil and tap switch are missing. In their place are a fourth tube, a two-gang DeJur variable capacitor and two coils. The coils and UV-type tube socket are mounted on a Micarta plate supported by heavy metal brackets. One of the filament rheostats is not original. From the grid leak onward, the set is original. Someone replaced the regenerative front end with a tuned RF amplifier. (The tubes were left out to make the picture clearer.)

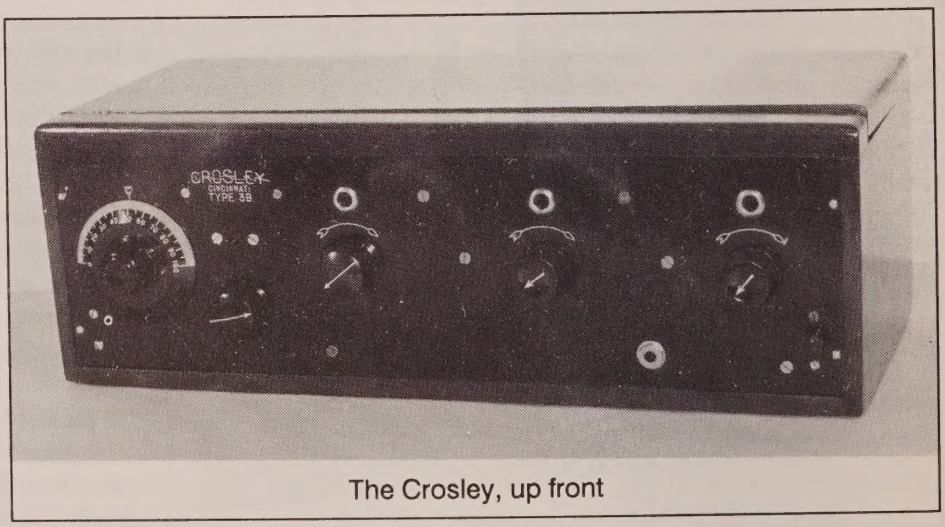
The workmanship is very professional. The coils appear to be hand-wound on commercial forms. Most of the new wiring is heavy bus like the original. A 250-K Frost rheostat has been put in the plate lead of the RF amplifier as a gain control and also to control a slight tendency to oscillate because the stage is not neutralized. Note that the coils are mounted at right angles to minimize coupling. The new parts were mounted in existing panel holes, and unused holes were filled with dummy screws so the front panel looks very good. Whoever modified this set knew his business, but why did he do it?

Anyone who has operated an early Crosley regenerator knows that the regeneration coil and "book" condenser are touchy, mechanically unstable, and hard to tune, requiring constant attention to keep the set going. These shortcomings were recognized at the time. Articles in contemporary radio magazines showed how to replace the book condenser with a better one.

My personal opinion is that early Crosley sets are interesting for their ingenuity, but are junk compared with the better-quality sets of the period with similar circuits and tube complements, such as the Westinghouse RC. Sure, the 3B sold for less than half the price of the RC, but you get what you pay for. Powel Crosley never made any pretense to quality, boasting (truthfully) that he made "Model T" radios. I suspect that the owners of these sets were not very happy with them once the novelty wore off. I must admit, however, that Crosley was able to survive the Depression while many makers of quality sets did not.

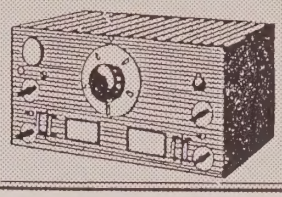
I surmise that this set was modified because its owner got tired of constantly having to fiddle with it, or maybe his wife complained that she could never get it to work. Of course, I'd rather have the original parts in the set, but I'm sure the owner never missed them at all. The modified set operates easily and smoothly. It is stable and has good selectivity. Naturally it is less sensitive than a regenerator, but not objectionably so.

This is a classic *Type 2* modification. Everything in the modified set was available to Crosley at the time, if he had wanted to use it.



The Crosley, up front

THE COMMUNICATION RECEIVER



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WILLIAM FIZETTE, K3ZJW
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All correspondence requires SASE for reply

THOSE NATIONAL POWER SUPPLIES

William B. Fizette, K3ZJW

INTRODUCTION

The National Company, Inc. (the proper name of the company, formally adopted in 1932) of Malden, Mass. was in the radio business from the early years, having started in 1924 by making components for the Browning-Drake broadcast tuner. The business prospered and over the next 15 years National became a world leader in the design and production of communications receivers, components, and associated products.

James Millen, who had started with National in 1926 as radio consultant, quickly became the chief engineer and general manager. In fact, he was the guiding light and "spark plug" of the company. While he had helped put himself through college by writing for various publications about "radio" subjects, his formal training was as a mechanical engineer, and the National product line reflected this background.

The people at National were also experienced in making products involving mechanical engineering. They merged their machine-shop expertise into the rapidly developing field of radio, and, under Millen's guidance, produced a constant stream of innovative products of high quality. These items, unique in the field in appearance and construction, emphasized the emerging science of shortwave communication. This emphasis continued after Millen left National in 1939 to start his own company.

THE EARLY YEARS

Millen's early experimental work had convinced him that receivers for shortwave use should have isolated power supplies. For decades, National receivers were designed around this principle (see the ad in *QST* for October, 1934 for background). This article began as an effort to sort out the vari-

POWER SUPPLIES FROM NATIONAL

This list covers the principal units. Lesser known supplies, and most of the variations such as 220-V or 25-Hz inputs, are not listed. Rack-mounted supplies are noted; the others are the "doghouse" table design. Year shown is approximate.

DESIGNATION	YEAR	NOTES
7180	1927	Heavy-duty "B" eliminator. The first "doghouse."
7180-AB	1927	"B" voltages + 2.5 & 5 V filament windings.
3580 Velvet B	1929	3 adjust. + 1 fixed "B." For the SW-4 Thrill Box.
SW-5 Power Unit	1930	Low-hum. Product of Millen/Kruse research.
5880-AB	1931	4-prong power socket; for HF receivers like SW-3.
5880-AB-S	1932	5-prong socket with 2 "B" voltages. For the SW-58, ACSW-45.
GR-SPU	1932	Rack-mounted. For AGS; later the HRO.
GR-DPU	1932	Rack-mounted. Double supply; for 2 receivers like AGS/SW-58C.
5887-AB	1933	For the FB-7; 180 VDC, 2.5 VAC.
5897-AB	1933	For FB-7, HRO, HRO Jr.; 240 VDC, 2.5 VAC.
5886-AB	1933	For 6-V receivers (SRR, 1-10, etc.); 180 VDC.
SPC	1936	Rack unit: combo speaker, power, coils for HRO.
686	1939	Vibrator pack, 6-V; 165 VDC @ 50 mA. 6X5 or 0Z4 tube. #1286 for 12 V.
SPU-686	1939	Rack version of the 686.
697	1939	Same as #5897, except 6.3 VAC.
SPU-697	1939	Rack version of the #697.
5856	1939	For the NHU receiver; 200 VDC, 6.3 VAC.
CNA-20090	1939	For the Navy RAS version of the HRO; rack-mounted. 5Z3 tube.
CNA-20089	1939	25-Hz version of CNA-20090.
5886 Version II	1941	General utility pack; 240 VDC, 6.3 VAC.

ous National supplies, which are so similar in appearance as to be confusing. Sources consulted included National catalogs, instruction manuals for the various receivers, and advertising covering the years 1927-49 in *QST* and the ARRL Handbooks.

While some inconsistencies were noted, the following material fairly represents the National stable of power supplies through 1950, and should serve as a guide in their proper use. National receivers should be matched to the correct power supply to avoid equipment damage.

The power supplies were either table-mounted (nicknamed the "doghouse") or rack-mounted. All were of high quality, heavily constructed, replete with mechanical and electrical innovations. The sequence of development followed the general progression of receiver power supplies, starting with "B" eliminators (so-called "Socket Power"), then to combined packs which supplied 2.5 VAC for the new AC tube heaters as well as the B+, to the supplies which powered receivers with 6-V tubes. Other variations and combinations were available: 220-VAC or 25-Hz sources, combined packs supplying both 2.5- and 6-V heaters, etc.

The "doghouse" design first appeared in 1927 in the National-B Type 7180 heavy-duty "B" battery eliminator. While other manufacturers were offering battery eliminators, the National product was marketed as "an entirely new and unique heavy duty better-B . . . a strictly heavy-duty power unit" (National Bulletin Q-123.) Four B+ voltages were available, three adjustable and one fixed at 180 V (at 70 mA) with terminal posts on a sloping panel. The distinctive heavy steel cover could be removed easily. This unit was in due course designated the Super Velvet-B Type 7180 (Bulletin 144), with four adjustable B+ taps off a common 14,000-ohm 25-watt resistor, with each tap individually filtered.

Another version, the "AB" 7180, designed for AC-tube receivers, had two 2.5-V and one 5-V winding in addition to the B+ taps.

The National Velvet-B, also in "doghouse" style but somewhat smaller, was announced in January, 1929 (Bulletin 132.) It provided three adjustable voltages and one fixed (180 V) suitable for one- to six-tube sets. In due course it was termed the Velvet-B Type 3580 (Bulletin 144.)

The first table supply in 1927 established the physical design which prevailed for many years. The rectifier, a UX-280 (later 80; not changed to a 5Y3 until after WW II), hung upside down inside the case and was accessible through the bottom. In the beginning the transformer, choke and filter-capacitor modules were tar-encased, following prevailing practice, and the switch was part of the cloth-covered line cord.

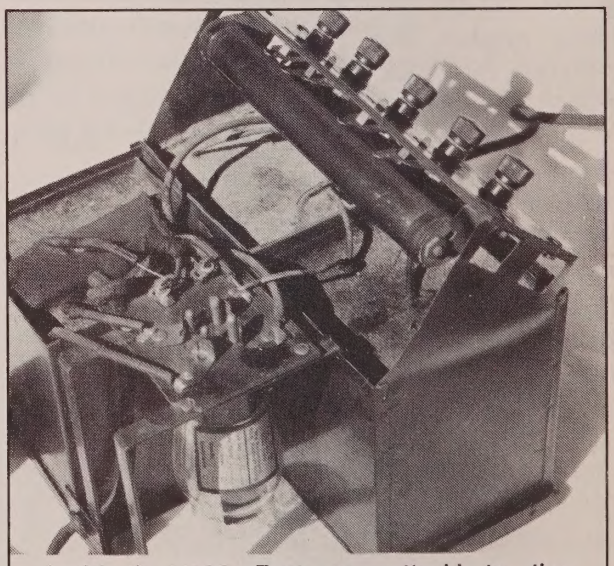
At the same time, National was rapidly building its reputation as a supplier of distinctive and high-quality parts. The older catalogs and advertising present a line of power-supply components, uniquely National in appearance.

The Type 3580B power unit was listed in the 1930 ARRL Handbook, 6th Edition, for use with the National SW-4 screen-grid shortwave receiver.

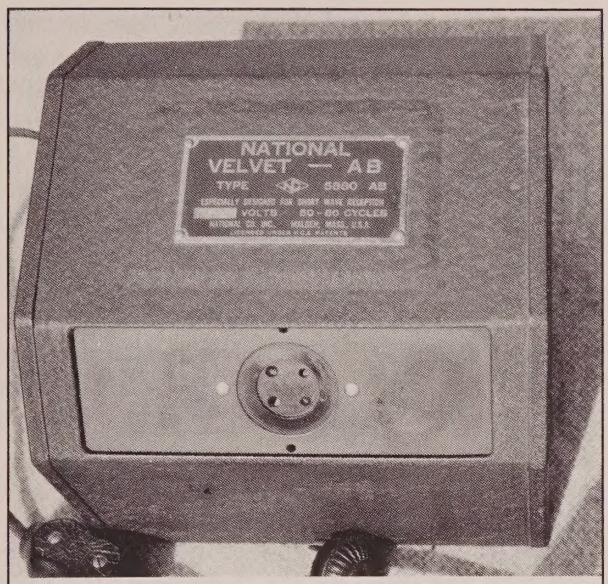
THE SW-5 AND FUNDAMENTAL RESEARCH

In 1930 the National ACSW-5 "Thrill Box" shortwave receiver was announced, firmly establishing Jim Millen and National as experts in the art of short-wave reception. Copyrighted by National in 1930, "The Manual of Short Wave Radio," compiled and edited by Zeh Bouck with 11 contributors, included a key article by Millen and Robert S. Kruse titled "An Analysis of AC Operat-

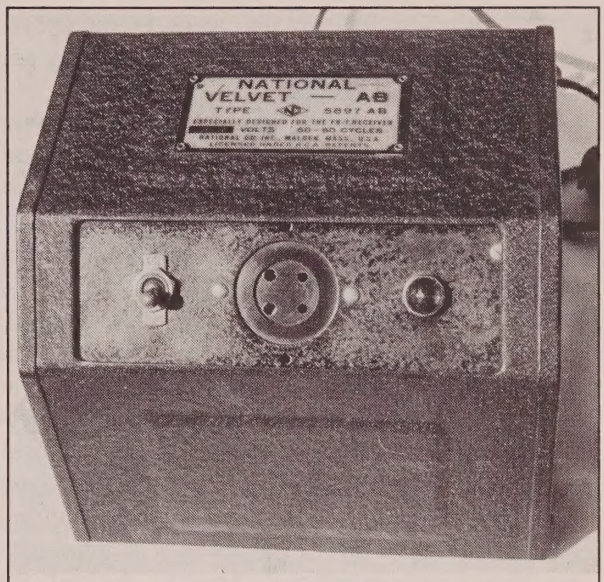
National 7180 B-eliminator. The four voltages are set by rockers above the terminals.



Inside the 7180. Parts are potted in tar, the tube socket is marked RECTRON, and the voltages are tapped off a common resistor by rotating sliders. Note the line-cord switch.



The 5880 Velvet AB supply, as used with the early Thrill Box receiver. Nameplate proclaims "ESPECIALLY DESIGNED FOR SHORT WAVE RECEPTION."



The 5897 Velvet AB supply, designed for the FB-7. Nameplate announces "ESPECIALLY DESIGNED FOR THE FB-7 RECEIVER." This particular unit was shipped with an early HRO.

ed Short-Wave Receiver Design." This had first appeared in the June 1930 issue of *Radio News*, and included discussion of the AC power supply as an important element of the system.

Briefly, one of the design parameters of the ACSW-5 was hum-free operation on the short waves, much more difficult to achieve than in BC-band receivers. After a year of laboratory work, Millen and Kruse announced that they had achieved this goal, and the end result was, indeed, totally hum-free operation. The features of the power supply included (1) separate from receiver, and at least three feet away; (2) completely shielded, with a steel cabinet to exclude stray low-frequency magnetic fields; (3) Low inherent hum in the output . . . at least a double-section filter with good quality chokes and plenty of condenser capacity; (4) The transformer to have an electrostatic shield between the windings, isolating the set from line disturbances; (5) An RF filter (RF choke and 0.01-μF mica bypass) in the output of the rectifier tube; (6) Voltage dividers in the *receiver*, not the power supply, to eliminate RF or common coupling from the power supply.

Some physical changes appeared in the table power packs about this time. While the doghouse design remained, the individual taps of the "B" eliminator were replaced with a four- or five-pin socket, depending on the receiver model. Some time later the AC cord in-line switch was replaced with a panel-mounted toggle unit.

The SW-5 power unit supplied 180 VDC and 2.5 VAC for the heaters. The term "tunable hum" was used for the first time, referring to a type of hum having its origin in the power line. Readers who wish to read more about the SW-5 and its powering are referred to the Kruse article in the January 1931 issue of *QST*, and to John Nagle's classic article in *CQ* for November 1978.

THE EARLY THIRTIES

In April 1931, a National *QST* ad listed the low-hum 5880 power unit, designed for high-frequency work. In writing this article I ran into some confusion regarding this model. One version (see photo) has a four-prong socket (original equipment, riveted in place), while the instruction book for the ACSW-58 amateur receiver, copyrighted 1932, clearly shows a five-prong socket on a Type 5880. The distinction seems to be in the power demands of the SW-58; the 5880-AB (four-prong socket) was the norm, and could be used with the new SW-3 and other regenerative receivers, while the SW-58 used push-pull 45s in the output, and required both 180- and 300-VDC sources. This supply was designated the 5880-AB-S, and had a five-prong socket. This unit could also be used with the ACSW-45.

Both supplies, incidentally, were available in either 110- or 220-V versions; also, 25-Hz models were listed. The catalog designations were 5880-AB, 5880-AB-25, 5880-AB-220, 5880-AB-S, and 5880-AB-S25. While the type may be listed on the label, check carefully if you wish to use one of these supplies. You may find a 750-ohm bias resistor for the P-P 45s in the filament center tap if you have the -S model.

The specifications for the 5880-AB were plate supply 180 V at 30 mA, and heaters 2.5 VAC at 8.75 A. The circuit included a double-section hum filter, an RF filter, an electrostatic shield around the primary, and balancing resistors across the filament windings. In the 5880-AB-S supply it would appear that the higher voltage was tapped off the junction of the two filter chokes.

All supplies, incidentally, were manufactured under license from RCA, and all advertising and even the product labels carried this notation. National was fortunate in having the RCA license, and it became of considerable value as their product line expanded. Nagle's *CQ* article discusses this point.

Following a detailed description by Millen in the September, 1931 issue of *QST*, the famous SW-3 receiver was announced the next month. The AC version used the Type 5880 power pack, and the advertising emphasized hum-free operation. The pack listed for $34.50 and was sold by the Leeds mail-order supply house for $19.00, still a considerable sum in those days. As a consequence, many SW-3 purchasers tried to economize by building their own supplies from old receiver components, not always with satisfactory results. As with the later FB-7 and the HRO, it was necessary to have 2.5 V at the tube sockets, and the voltage drop in the power cable could lead to low filament voltage and erratic receiver operation. This was discussed by Millen in the second of his famous "letters" in *QST* in the April, 1934 issue.

THE AGS AND FB-7 RECEIVERS

The AGS airport receiver was announced in October, 1932, and with it the first (that this writer has encountered) of the rack-mounted supplies, the GR-SPU and GR-DPU units. The initials stand for Ground Radio - Single (Double) Power Unit. To explain the dual unit, the AGS was often paired with the SW-58C, a regenerative stand-by receiver. A single power panel, similar to that pictured below, housed two separate power supplies. These could assume several forms, depending on receiver heater requirements; either 2.5 or 6 V or a combination. Catalog ordering designations were GR-DPU2/6, GR-DPU6/6, and so forth. The same approach was used with the -SPU model.

The inside of the -DPU version is pictured below, and a circuit diagram is available in Rider's Vol. 3. Two 15-Hy chokes were combined with three 8-μF filter capacitors. The specs on these units were the same as for the 5880, 5886, or 5897, whichever was ordered at the time. They are substantial and can be used on the FB-7 and the HRO as well as the AGS. Again, watch the heater voltage.

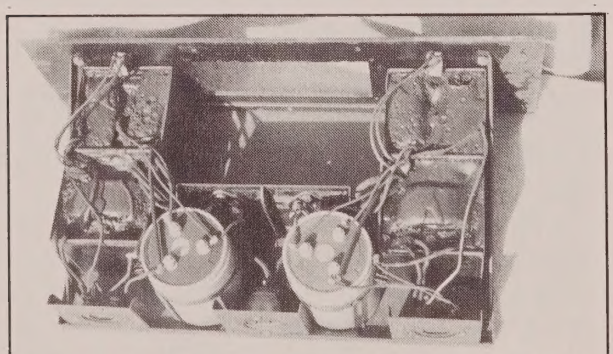
The FB-7 was announced in March, 1933, and with it the new 5887 power pack. This unit was lower priced than the 5880 (which could also be used), as the FB-7 did not require the degree of filtering that the earlier regenerative receivers needed. The 5897 AB supply was also designed for the FB-7, providing a higher plate voltage (around 240 V) to power the 59 output tube for maximum audio.

The National ad in the October, 1933 issue of *QST* (Bulletin 220) is a goldmine of information on the National power supplies to date. The 5886-AB pack was listed for the three-tube SRR high-frequency receiver, which had the relatively low power demands of 6 V AC at 0.9 A for the heaters, and 180 VDC. However, it apparently had enough capacity to operate the HRO (see below.)

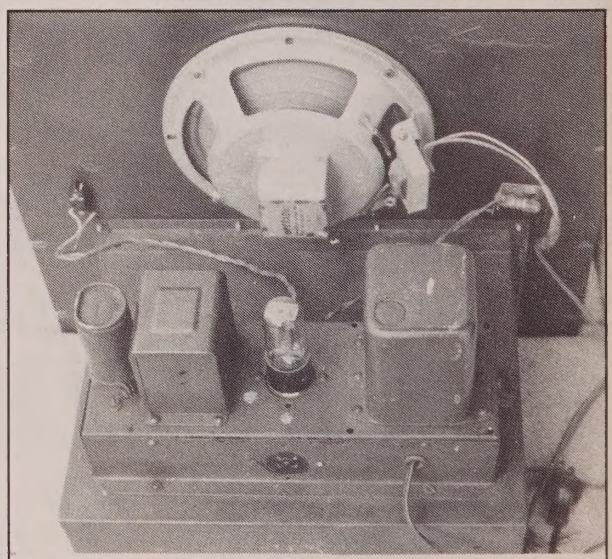
POWERING THE HRO

In October, 1934 the most famous National receiver, the HRO, was announced (Bulletin 240, reproduced in *QST*, October, 1934.) Initial shipments of the HRO were made with the FB-7 supply 5897-AB. The 6-volt version of the HRO would work with either the AGS rack supply or the Type 5886 pack. The 5887 and 5880 packs could be used, but were not recommended. The HRO Jr. (February, 1936) also used the 5897-AB supply.

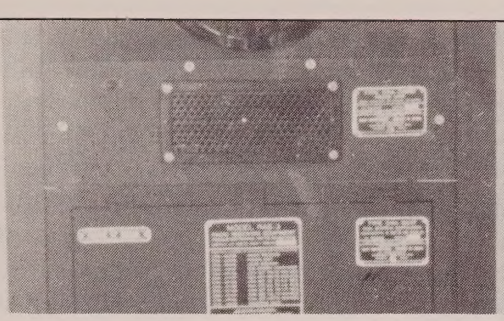
Unfortunately, within a short time of the introduction of the HRO, a modulation hum around 15 MHz was discovered when six-volt tubes were used with the AC pack. Not until better tubes were introduced in 1939 was this defect remedied. In the mean time, batteries were suggested for tube



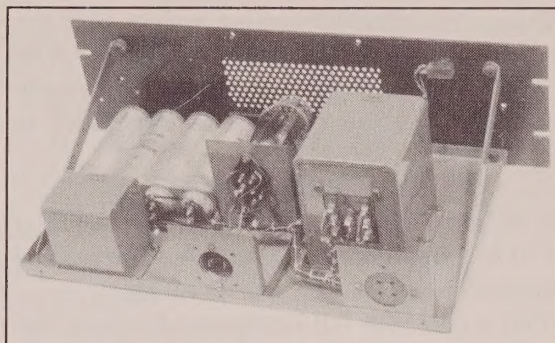
The original GR-DPU for the AGS and SW58-C combination, less tubes and front cover. Note the "Mershon"-style capacitors.



An SPC combination rack unit for use with the HRO. The power transformer and speaker have been replaced.



Front view of the RAS power unit, as installed in the complete receiver. Virtually all National rack units resemble this.



The inside of the RAS power unit. Note the bank of oil-paper filter capacitors.

heaters when using six-volt tubes in the HRO.

Millen deviated from his strong views on external power supplies in designing the NC-100 series of receivers, first announced in 1936. The common explanation is that the high power requirements necessitated an internal supply, but since he was aiming at a broader market than amateurs and SWLs, it is probable that he was considering consumer resistance to the external pack with its dangling cable and other complexities. Whatever the reasoning, the NC-100 and its siblings were a resounding success.

Another sidelight to the power-supply story was the introduction of the combination panel unit for use with the HRO, the SPC (Speaker-Power-Coils). National also sold the special relay rack, the MRR, for $13.50 list. The postwar HRO-5R rack-version receiver had an SPC option.

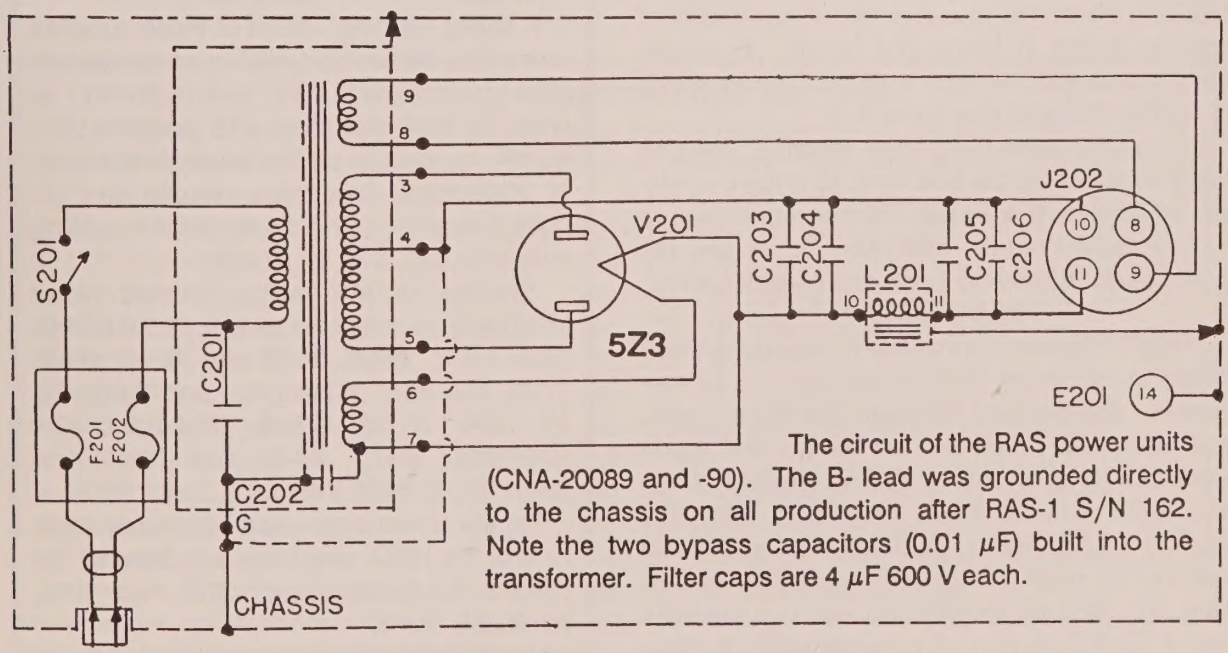
In April, 1939 National finally approved the use of 6.3-V AC tubes in the HRO. The 697 power unit was recommended, the same as the 5897 but with a 6.3-V heater winding (specs: 115-V 60-Hz input, 6.3 VAC at 3.4 A, 240 VDC at 75 mA). It listed for $29.50, including, at long last, the tube! There was also a rack version of this supply, the SPU-697.

As National receivers spread across the world of shortwave communications, a demand arose for power supplies for emergency work. Catalog 300L mentions a 6-V vibrator pack, the Model 686, which could power National AC receivers, including the HRO, NC-100, SW-3, and NC-200, from a standard car battery. Versions included the 686-S and the SPU-686-S. These produced 165 VDC at 50 mA. Models for 12 volts were available and are covered in Rider's.

THE NAVY RAS RECEIVER

An unusual and still little-known version of the HRO was the model designed for the U. S. Navy in the late 1930s, the RAS. This receiver was essentially an HRO Jr. with a 175-kHz IF for marine use and with a full set of coils, all mounted in a massive desk rack. The 115-V power supply (see photos) was designated CNA-20090 (60-Hz) or -20089 (25-Hz). Specs were 240 VDC at 70 mA and 6.2 VAC [yes, 6.2!] at 3.4 A, with a power consumption of 70 watts.

Construction was heavy, with high quality components as with most National gear, but with military requirements added. Both sides of the primary were fused, the transformer (see diagram) had an electrostatic shield, and C201 and 202 are



The circuit of the RAS power units (CNA-20089 and -90). The B- lead was grounded directly to the chassis on all production after RAS-1 S/N 162. Note the two bypass capacitors (0.01 μF) built into the transformer. Filter caps are 4 μF 600 V each.

RF filters. The filter capacitors were paper, not electrolytics, and are still likely to be good. The RAS power unit is a fine general-purpose supply for any of the common National receivers such as the HRO or FB-7.

MISCELLANEOUS

The National VHF receiver, the NHU, required 200 V at 65 mA and 6.3 VAC at 3 A. The manual recommended the Type 5856 table supply.

In 1941 a new 5886 AB supply was designed, less the center-tapped heater resistor. To use the older 5886 with the Universal SW-3, it will be necessary to remove this resistor to eliminate the B- connection to the heater circuit.

The 5886 is one of the basic utility supplies and is found in different versions. In addition to those mentioned above, the postwar model was finished in smooth gray enamel, used a 5Y3 rectifier, and often had a 110-220 V switch inside the cabinet. It was also used to power the 1-10 VHF receiver.

Immediately postwar (in January, 1946), the HRO-5 was announced, paired with the 697 power unit. In August, 1947 the HRO-7 was advertised, and a subsequent ad shows the HRO-7C in a table rack with the SPC-1 combination unit. Then, in November 1949 the HRO-50 appeared with a built-in supply. This was the beginning of the end for the external power supply and the "doghouse."

ON RESTORING A NATIONAL POWER SUPPLY FOR ACTIVE USE

It is feasible to restore these units electrically using standard techniques. However, many of the components are "period" and quite distinctive, especially the filter capacitors. I prefer to leave these physically in place and wire small modern cartridge electrolytics into the circuit. Unfortunately, many of the original National transformers have burned out and have been replaced (see the SPC photo). In order to preclude this I routinely check current demand of any National receiver before it leaves the bench. A simple male-female adapter with a 100-mA meter wired in the B+ line is all that is needed.

It is also a good idea, when applying power to these supplies for the first time, to bring the voltage up slowly with a Variac. Monitoring voltage as well as current checks both the receiver and the power pack. Ripple can be measured with a scope.

CONCLUSION

Millen's objective was to make National a world leader in shortwave radio technology and he succeeded. The National Company line of radio gear and associated products were unique and highly successful for many years. Today collectors recognize these items as highly desirable. When the original accessories are included with a National receiver the price paid rises dramatically. While I have not done any calculations, one can speculate that a significant part of National sales (perhaps half?) came from components and accessories: the power supplies, loudspeakers, extra coils, and other gear. Unfortunately, the sales records were destroyed years ago, and we are left with nothing more than speculation, and perhaps testimonials.

But we are fortunate to have the products to work with and enjoy. National is a big story, and the power supplies very much a part of the receiver technology. If anyone has anything to add or corrections to make to the above information, the writer would appreciate hearing from you.

ACKNOWLEDGMENT

The writer expresses his appreciation to AWA member Paul Bohlander, W3VVS, for allowing review of his notes on National power supplies in preparation of this article.

MORE ON NATIONAL SUPPLIES

The list below may be helpful in matching a National receiver with the right power unit.

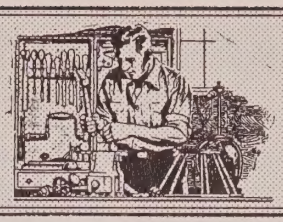
1-10, 1-10A	5886
ACSW-3 (2.5 V)	5880-AB
ACSW-45	5880-AB-S
AGS	GR-SPU or GR-DPU
FB-7	5887-AB or 5897-AB
HFS	5886 or 686S
HRO (2.5 V)	GR-SPU or 5897-AB
HRO (6 V)	5886-AB or 697
HRO (12 V)	1286
HRO-5R	SPC (option) or 697
HRO Jr. (2.5 V)	5897-AB
NHU	5856
RAS	CNA-20090 (or -20089)
R-211/U	SPU-697
SRR	5886-AB
SW-3U (6 V)	5886
SW-4	3580
SW-58	5880-AB-S
SW-58C	GR-DPU

A safety warning: most of these supplies lack a bleeder resistor, relying on the associated receiver - with "B+" switch closed - to drain the filter capacitors after power is turned off. In working on the supply with receiver unplugged, an unwary restorer can get quite a surprise. There's no harm in adding a bleeder (say, 220 K 1/2 watt).

Besides National service manuals, repair information is available as follows: **GRDPU**, Rider's 3-1; **650S**, 21-49 and 22-46; **686S**: 17-28 and 22-5 (Changes), and Sams 62-14; **1286**: 14-35; **1286S**: 17-28 and 22-5 (Changes); **697**: 14-35 and 17-21, and Sams 50-12; **5886 Version** II, Sams 62-14.

For the power units used with export versions of the HRO, see Louis Meulstee's "The HRO in the British Army," *OTB*, Feb. 1992, pp. 21-23. (LAS)

EQUIPMENT RESTORATION



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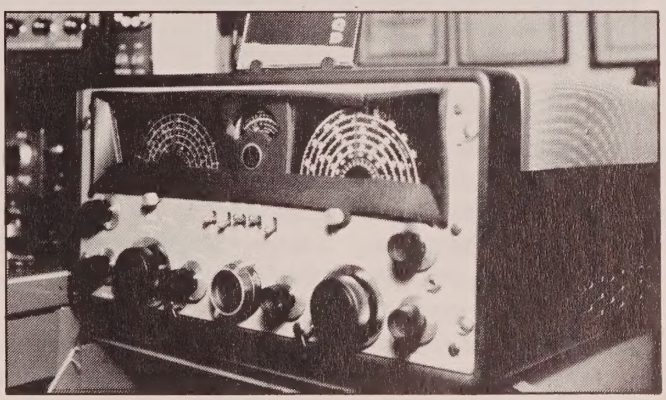
HALLICRAFTERS RECEIVER CABINET RESTORATION

Wayne R. Cripe, W2RQD
Rte. 31, RR 1, Box 224, Durhamville, NY 13054

Hallicrafters had at least two different colors of paint, depending on the year the equipment was manufactured. This article will deal with the early '50s "gray" color rather than the "blues" of the '30s and '40s. I only once had the opportunity to try re-doing an old S20-R in "blue," but the owner, Bob Decker, AA2CU, decided to keep-it-original.

I recently re-did my SX-88. A little elbow grease, some household items, two cans of spray paint, and you, too, can be proud to display the results and make that receiver of yesteryear look new.



Start with an empty cabinet; remove the perforated top and give both parts a good cleaning with soap and water. Wipe dry - blow off with compressed air and let sit in the sun for a while. Then set to doing some minor sanding with 400 to 600 wet/dry paper on those areas where time took its worst toll. I did it *dry*, wiping the residue off with quick strokes with a rag soaked with lacquer thinner.

When all is clean and dry, select a clean dust-free area to do the painting. I did the perforated top first, using the closest match I could find: Ford Motor Company "argent" color, designated D7AZ-19000-A, obtained from my local dealer. It's a dull, semi-flat silverish tone. After two to three coats, it was a very satisfactory match. Nothing more was done to the top except for allowing it to dry fully.

The cabinet was next. The paint selected was Rust-Oleum #2089 dark gray primer. This is a very dull matte, rough-finished primer and required smoothing using long, straight, light strokes with 0000 steel wool. Be careful, this will be your final appearance finish, so be gentle and keep those strokes light and straight to minimize the scratch marks. I applied three or four light even coats, steel-wooling between coats.

Final buffing was accomplished with a soft cloth and a few applications of a very fine rubbing compound. I used 3M "Finesse-It 2" because I had some on hand for use on classic cars.

I did the same for the R-42 speaker.

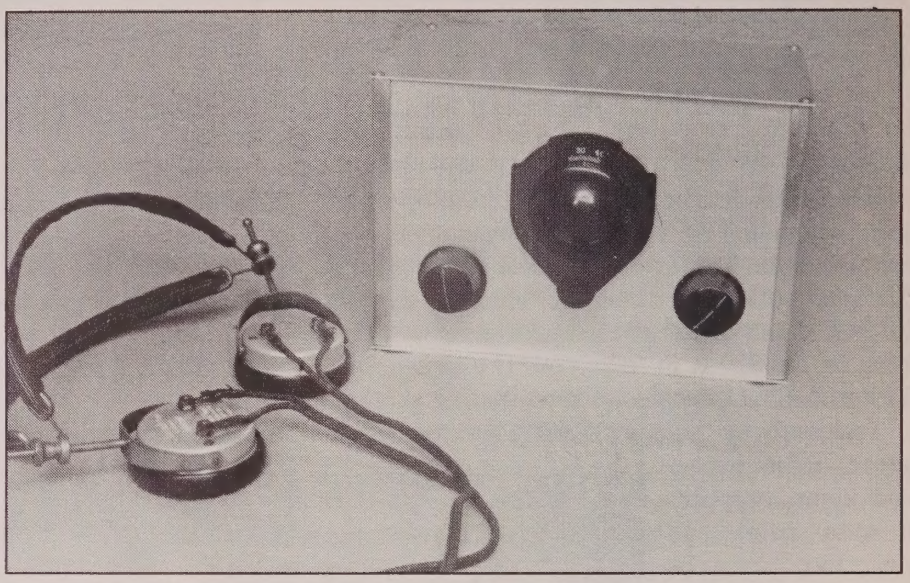
RESULTS - MUSEUM TUBE AUCTION

Bidding was brisk for the de-accessioned tubes sold by mail auction (*OTB*, Nov. 1992, p. 4). Winning bids are listed below. Tubes were good except as indicated. NIB: New in Box. (Dexter Deeley)

1. 201As: 10 off-brand (CeCo, Rytone, Sonatron, Songbird, Speed, Televocal, etc... 110
2. WE 216As (2) ... 180
3. WE 205Ds (2) ... 240
4. WE 102F (2) ... 160
5. WE 215As, NIB (2) ... 80
6. WE 217A ... 100
7. WE VT1, with gold tips ... 60
8. WE VT1, less gold tips ... 50
9. WE VT2 ... 80
10. WE 205D, NIB ... 160
11. UV-201A, brass, tipped, NIB ... 60
12. UV-201 & UV-200, brass, tipped ... 100
13. UV-199s (4) ... 92
14. UX-199s (2) ... 40
15. UX-213 ... 21
16. UX-216B ... 50
17. 859, NIB; 864; 865; 876, NIB ... 55
18. TB1, NIB ... 47
19. TB1 ... 57
20. Moorhead/de Forest/Marconi VT, open ... 36
21. Myers Audion, new in screw-top can ... 42
22. Electrad diode, open ... 42
23. Audiotron, label, 1 good fil, all wires ... 77
24. Zenith 80, sealed in can ... 18

RECONSTRUCTION OF A TYPE-30 REGENERATIVE RECEIVER

David C. Ivarson, W3WBE
5 Church Rd., Collegeville, PA 19426

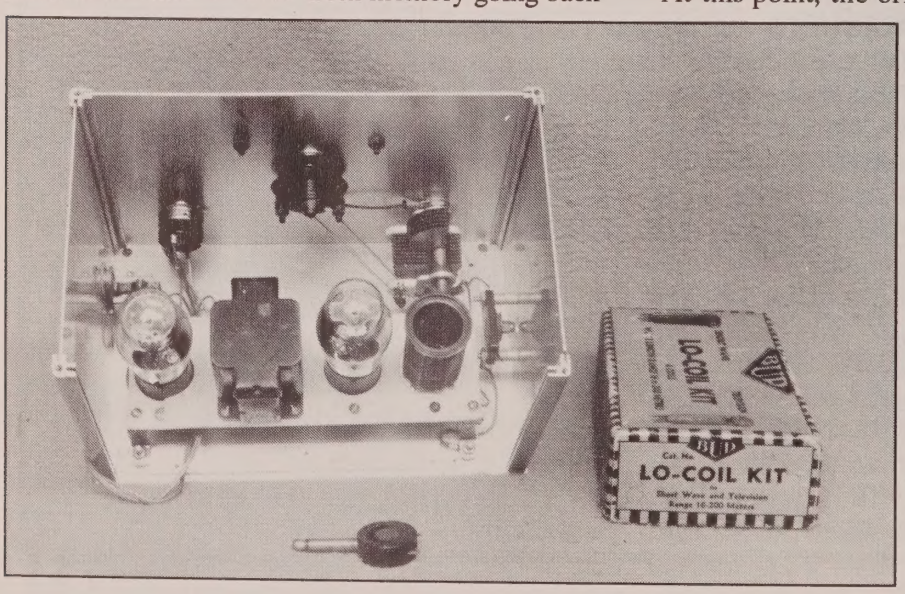


This restoration project began when I discovered, quite by accident, an old dial-drive mechanism and a Pilot bandspread condenser during a recent garage clean-out. I recognized them as parts of a two-tube regenerative receiver that my dad gave me somewhere back in the mid-40s. Shortly after that, the set was cannibalized for parts. At that time it seemed of little use in the presence of more modern gear.

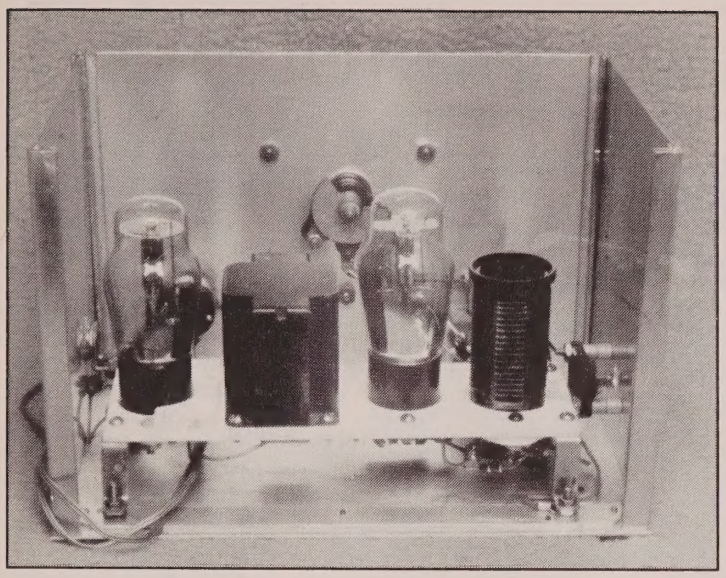
With old-time radio being popular these days, I wondered if a reconstruction of that receiver would be possible. There was also the matter of conscience: surely these nice old components deserved better than lying about in a junk box. A careful search of the attic and the garage over the next several weeks turned up about 70 per cent of the receiver's original parts. That was enough of an incentive to get on with the project.

Some goals and guidelines had to be established. First of all, I wanted a working receiver and it had to look like the original. Reconciling these two ideas would mean accepting some compromises. This meant that it would not be possible to take a purist approach, having each and every component of the correct vintage. There were also some obstacles to be overcome: there were no plans, photographs or drawings of this receiver. All of that information had to come from memory going back more than 40 years.

Three of the receiver's original aluminum corner posts were found in my scrap-metal box, along with a large part of the original back panel. These established the height and the width dimensions for the case. Its depth had to be a best guess from memory. The corner posts appeared to be of an extruded design, slotted along their length to receive the panels, and with a tapped hole in each end for fixing the top and bottom cover plates. I fabricated a fourth corner post by assembling a sandwich of three pieces of aluminum angle, with the center piece recessed to form the slot for the panels. The assembly was then shaped to look like the others, and threads were tapped in each end. The sides, front, top and bottom pieces were made from aluminum sheet as close to the original gauge as I could find locally.



At this point, the original electrical parts inventory was beginning to look pretty good. There was a set of Bud plug-in coils in their original box, the interstage coupling transformer, the antenna coupling condenser, two of the wafer-type tube sockets, and the brass Hammarlund tuning condenser - beat up and missing a couple of plates but repairable. I also found three Type 30 tubes in the attic. Filament continuity tested good on



two of the three, which I took as a good omen, and proceeded with the next phase of the project.

My recollection of the internal chassis was one of a black bakelite strip with an in-line arrangement of the coil socket, detector tube, coupling transformer and audio tube; the strip being fixed to the bottom plate by four Z-brackets about 1" long.

The chassis assembly had to be a compromise, as no original-type bakelite was available, nor was any cloth-covered wire. And the original cadmium-plated screws were long gone. The new chassis was fabricated from several pieces of Plexiglas joined to make up the necessary size. The junkbox yielded another four-prong socket (vintage unknown) for the plug-in coil, and several mica capacitors that were used in the circuit.

The front panel arrangement also had to come from memory. The original tuning and regeneration control knobs turned up, along with the bandspread dial, and all of the items appeared to be in good condition. The original regeneration control with its on-off switch was not found, and a Radio Shack substitution was made for this part.

Finding a suitable schematic diagram was perhaps the easiest part of the task. Years ago a copy of Gernsback's March, 1938 issue of *Radio Craft* (not a latter-day reproduction!) was given to me and I have stubbornly refused to part with it over the years. That landmark issue is full of old receiver circuits including several regenerative arrangements.

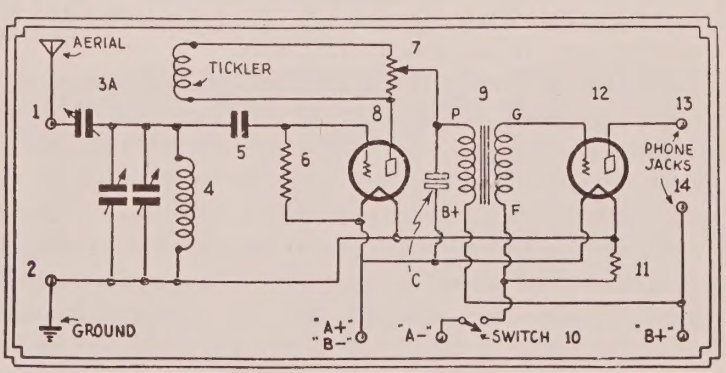
A few more long forgotten goodies surfaced from the junkbox: a bakelite rod with a socket end that was used to reach through the side panel of the receiver and adjust the antenna coupling condenser, and a ¼-inch phone plug adapter with tip jacks for the headphones. The Brandes headphones had been around the shack for years and they still worked. Their sound fidelity is terrible and they're not comfortable, but they do seem to have a cutoff around 4 kHz that somehow makes shortwave listening a little easier.

The project eventually came to the point where it was time to apply power, and that meant providing a suitable battery supply. As I remember, the filaments were originally supplied by a pair of No. 6 dry cells, and the "B" battery was a rather large Burgess 45-V affair, about as wide as the receiver itself. For the present, a couple of D-cells in a holder would suffice for the filament supply, and the "B" battery was made quite easily from a stack of nine-volt transistor radio batteries.

It was a pleasant surprise when the batteries were connected and the receiver worked on the first try! Evidently the circuit was wired correctly, including the feedback coil connections. Compared to later-vintage equipment, this receiver presents a challenge to its operator. The antenna coupling adjustment is critical, and received signals can be pulled in both frequency and amplitude by stronger adjacent stations.

Putting the set through its paces with all four plug-in coils brought back memories. The set of coils provides a tuning range of approximately 1 to 15 MHz, with mechanical stability becoming a problem at the upper end of the tuning range. Another surprise was the reception of single-sideband signals (not heard back in the mid-'40s). These can be tuned in rather easily, with the regeneration control acting as a fine-tuning device.

Interestingly, this receiver's sensitivity in the absence of interfering signals compares favorably with that of a modern receiver. Perhaps there is a theoretical limit to the amount of energy that can be extracted from the passing wave which takes but one stage to achieve. Such is the legacy of Edwin Armstrong.



AMATEUR RADIO

EDITED BY
MIKE RAIDE, KA2RLK
Box 181, Bloomfield, NY 14443
All correspondence requires SASE for reply.

OLD-TIME CW CONTEST

A MEMORIAL TO LINC CUNDALL, W2LC

DATES and TIMES: Feb. 10-11 and 13-14. Start at 2300Z Feb. 10 (6:00 PM EST) and end at 2300Z Feb. 11 (6:00 PM EST). Repeat on Feb. 13-14.

OBJECTIVE: Contact the greatest number of AWA members. When calling, use "AWA AWA AWA de W2AN," as an example. On contact, exchange year of equipment, such as "TX 36" for a 1936 transmitter and "RX 34" for a 1934 receiver. Send "MOD" for modern (1942 or later) gear.

RULES: A station will be scored only once on each band. Nonmember contacts, and estations not submitting logs, will not count.

FREQUENCIES: 1800-1820, 3580-3600, 7030-7050, and 14060-14070 kHz, ± QRM. Concentrate 20- and 160-meter contacts on the hour.

SCORING SYSTEM:

QSO Zones: "E" eastern zone: US districts 1, 2, 3, 4, 8, 9 plus VE1, VE2, and VE3. "W" western zone: US districts 5, 6, 7, 0 plus VE4, VE5, VE6, and VE7. "DX" zone: All others.

QSO Points per Contact, by Zone:

"E" to "E" or "W" to "W": 1
"E" to "W" or "W" to "E": 2
"E," "W" or "DX" to "DX": 3

Equipment Multipliers:

Equipment	Multiplier
MOD TX and RX	1
OT TX or RX	2
OT TX and RX	3

Power Multipliers (input to final):

100 watts and up: 2
3-99 watts: 3
0-2.99 watts: 4. **(Note: 2.99!)**

Determining Total Points per QSO

1. Find QSO points for the contact.
2. QSO points X your equipment multiplier X your power multiplier = Total points for the contact.

Examples:

1. W2AN contacts W2LV.
   Both are in "E" zone, for one QSO pt.
   Both have OT TX and RX, for 3 multiplier.
   Both are running 80 watts, for 3 multiplier.
   1 pt. X 3 X 3 = 9 pts. for contact.
2. W2BJI contacts W7BCT.
   "E" to "W" zone contact, for 2 QSO pts.
   W2BJI: OT TX and RX with 80 watts.
   W7BCT: OT RX; MOD TX at 120 watts.
   W2BJI's points: 2 pts. X 3 X 3 = 18 pts.
   W7BCT's points: 2 pts. X 2 X 2 = 8 pts.
3. W2AAU contacts W2AN.
   Both are in "E" zone, for 1 QSO pt.
   W2AAU uses MOD TX and RX, for equipment multiplier of 1; is running 120 watts for power multiplier of 2.
   W2AAU's points: 1 X 1 X 2 = 2 pts.

LOG SHEETS: will be sent to previous entrants. If you have not entered, write below for logs.

SEND LOGS TO: Mike Raide, KA2RLK, Box 181, Bloomfield, NY 14443 by April 1.

OT CONTEST QUESTIONNAIRE

The interest in the annual OT Contest prompted a questionnaire to be passed out at the "Amateur Radio" meeting at the recent Rochester Conference. The results were interesting, if not surprising.

Respondents overwhelmingly rejected a multiplier for use of open-wire feeders or combining the Fall 1929 QSO Party with the February event, and voted to keep the use of modern equipment and existing zone and equipment multipliers.

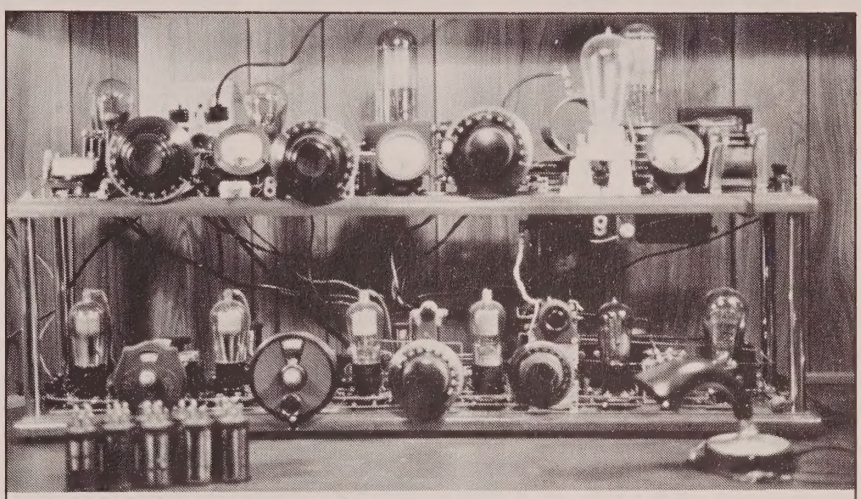
One question concerned a multiplier for 160-meter operation. The response was evenly divided. Some argued it is easier to fire up an OT rig on 160 than on 20, so why not have a 20-m multiplier? Members were also against using electronic keyers and felt we should continue the use of MOD since it increases participation, particularly for some old-timers who find it hard to get or use old gear.

Former Contest coordinator KE2ST, who checked past Contest logs, feels the rules should be, if anything, simplified. Conclusion: rules and multipliers remain the same except that some members wanted the "low power" level reduced to three watts to give fellows in the QRP class an opportunity to score. The excellent scoring in the 8-10 watt group indicates little need for an additional multiplier. Members in the "under 3 watt" category are asked to send in their tube lineup, voltage/current to final, and, of possible, a photo for the OTB (color prints acceptable). Note: for scoring, K2WW/7 is in the Seventh District. QSLs for W2AN are to be sent to W2ICE. (BK/MR)

BUILDING A 1929-ERA HAM STATION

Frank Hutchins, W2MAV
2034 Lake Josephine Dr., Sebring, FL 33872

If you remember the first radio your father brought home in 1925 and your radio experiences date from the mid-1930s, then you will appreciate the joy of reconstructing an amateur station of the 1929-30 era.



The complete station

I was into five-meter superregens and model-airplane radio control using 215A peanut tubes at age 15 in 1935, and received my ham ticket about 1939. I was a radar test eniner during the war and in 1951 built a television transmitter on 3/4 meter. But nothing is more nostalgic than designing and building a receiver and transmitter using parts from the Twenties.

After collecting a large number of tubes, parts and circuits of successful equipment of the Twenties era and thumbing through dozens of old *QST*s and other magazines, I finally came up with the designs shown.

The receiver includes two tuned stages of RF and a regenerative detector using UY-235 screen-grid tetrodes. (These are a bit modern for "1929" but can viewed as having been used to update a true 1929 set a couple of years later, replacing UY-224s.) The first AF is a UY-224 driving a UX-245 power amplifier which feeds an Atwater Kent horn speaker. These AF tubes are switched when transmitting on phone to become the speech amp for the carbon mike, a 1915 chest transmitter with long mouthpiece.

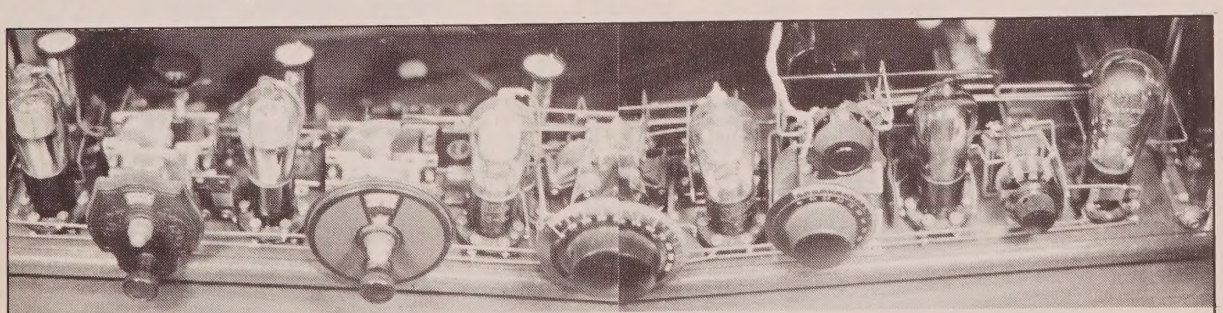
Screen-grid tubes were selected over triodes for superior gain without neutralization. They were on the "cutting edge" in 1929. Plug-in coils were wound for 160, 80, 40, and 20 meters and, of course, the broadcast band. When tuning in stations, all three tuning condensers must be peaked and the detector regeneration control constantly adjusted. The RF screen-voltage control must be set to prevent oscillation. Tuning was a chore in those days.

I might add that a receiver of this era will work fine with as few as four tubes with an untuned RF stage, thereby reducing the tuning hassle.

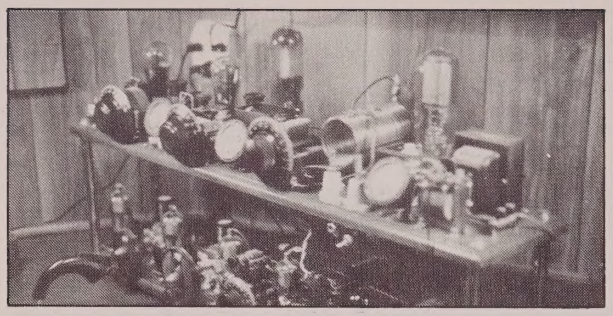
The transmitter evolved from some old UX-210s I had. The first breadboard 210 oscillator I ever saw was built by Bob Robinson, W3FK, in 1935. So, my oscillator had to be a UX-210. This drives a UX-210 buffer, which feeds the UV-203A final amplifier. All the RF plates are fed with RF chokes to keep dangerous voltages off the tuning condensers. The speech amp drives a 1926-vintage de Forest 511E as Class A Heising modulator.

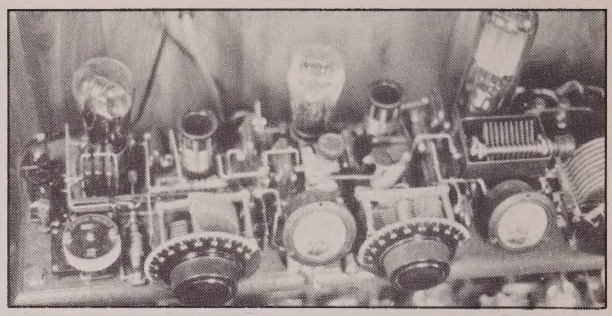
The final won't tune to 20 meters due to excessive circuit and tube capacitance, but then the receiver is difficult to tune on 20, especially on sideband signals. So I use the lower bands with a variety of crystals, one of which is from 1928.

The power supplies were assembled from a variety of WW II parts and provide all the filament, bias and plate voltages. No attempt was made to use tube rectifiers of the period since the supplies



The receiver, close up





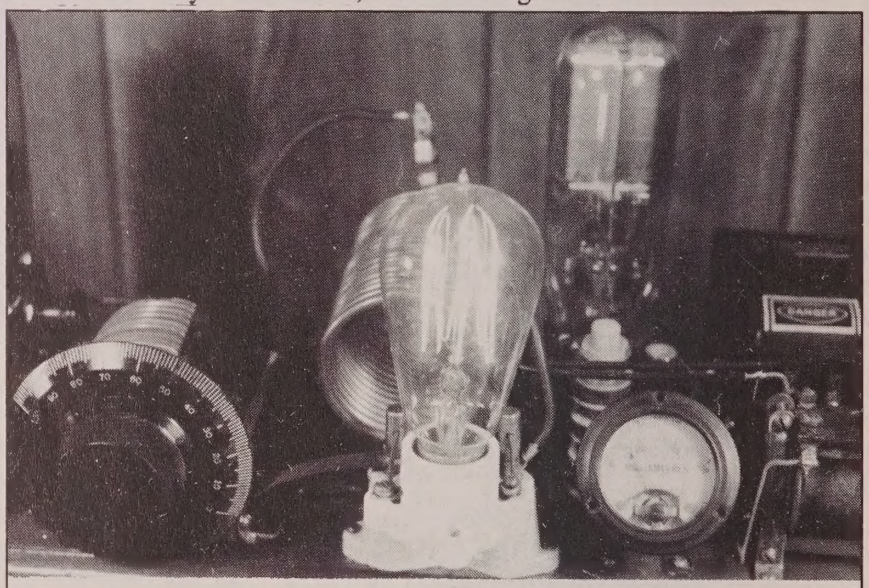
are hidden in a cabinet.

An L-C key-click filter (1927 design) plugs into the transmitter to improve CW operation. I use a 1920 light bulb as a dummy load.

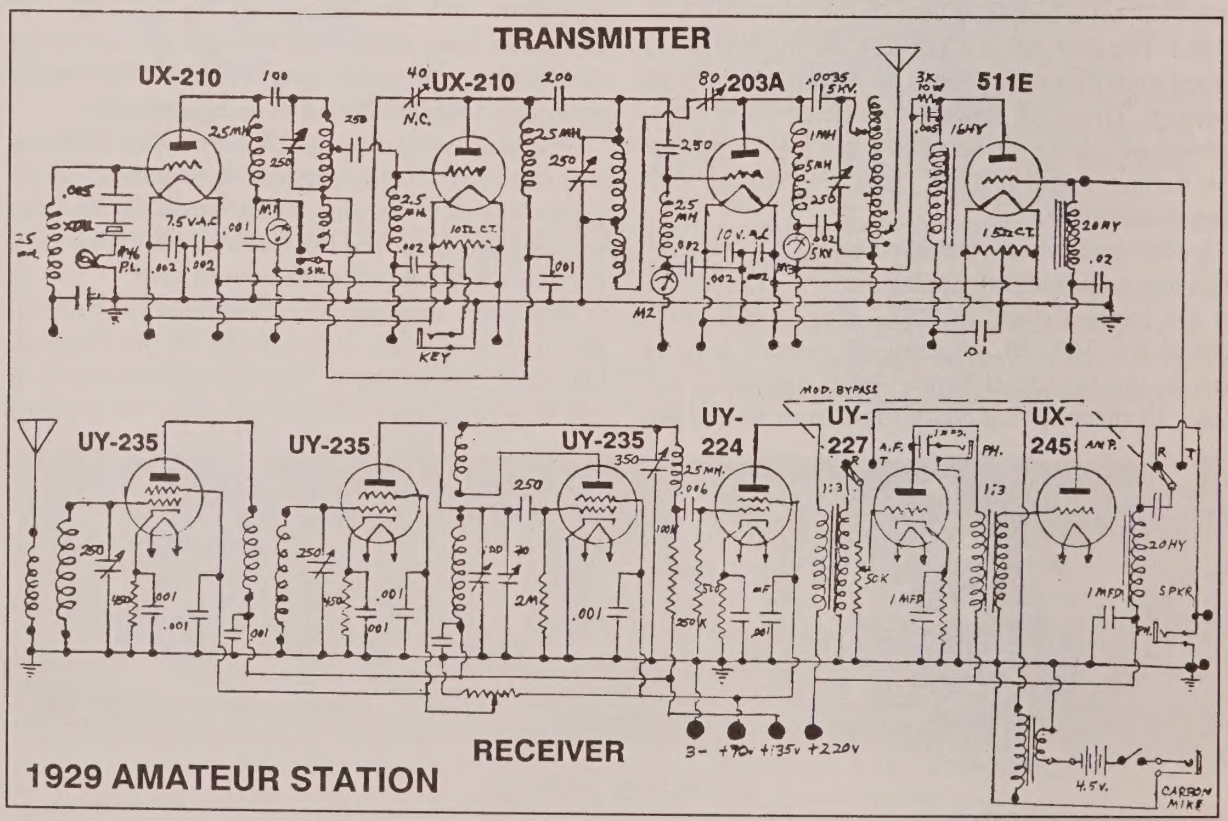
The rig was built first on pine breadboards and tested. Then I transferred the entire assembly to pre-varnished, routed mahogany boards. Every part is wired with square bus bar and all voltages are brought to the many binding posts with color-coded cables, as was done in those days.

All bypass capacitors are micas from the Twenties, as are all sockets, variable condensers and transformers. I used mounted glass resistors and globe tubes of the era. RF chokes were 2½ mH from the early Thirties, as were a few capacitors. Coil forms were from Japan, but some switches were from 1918. Construction and operating instructions are not included here because of different layouts, parts and tubes that may be used.

Be careful of the high voltage (1000 volts) - it can easily be lethal. I took 2000 volts across my hand in 1940; once is enough.



A cheerful glow in the dummy load



RARE AMATEUR QSL CARDS

Bruce Kelley

Interest is increasing in collecting early QSL or verification cards, which have three categories: amateur, shortwave listener (SWL) and broadcast listener (BCL). Few amateur cards date before WW I, with BCL beginning in the early '20s and SWL in the late '20s.

In the early days, radio amateurs did not use country prefixes. However, in the mid-'20s they began to explore the shorter wavelengths and to work stations outside their national boundaries. To identify themselves better for DX purposes, they started to add prefixes to their calls: "U" for U. S., "C" for Canada, etc. As an example, 1AW became U1AW.

In time this proved unsatisfactory, so they added an indicator for the continent: "N" for North America, "E" for Europe, "O" for Oceania, "A" for Asia. This resulted in NU for U. S. amateurs, NC Canada, EG Great Britain, EF France, OZ New Zealand, etc. U1AW became NU1AW. In some countries with little regulation, the amateur selected his own prefix. This all changed with the 1927 Washington Radio Conference where the first of today's prefix allocations originated.

Bob Baird, W9NN, sent in a copy of a seldom-seen letter issued by the Department of Commerce, dated June 22, 1928. Briefly, it stated that effective Oct. 1, 1928, all radio amateurs were to conform to the 1927 rules: they should stop using the prefix "NU" and use "W." An example: "NU6AA de NU8AA" must in the future be "W6AA de W8AA."

1930 SOVIET CARD - AU1AI

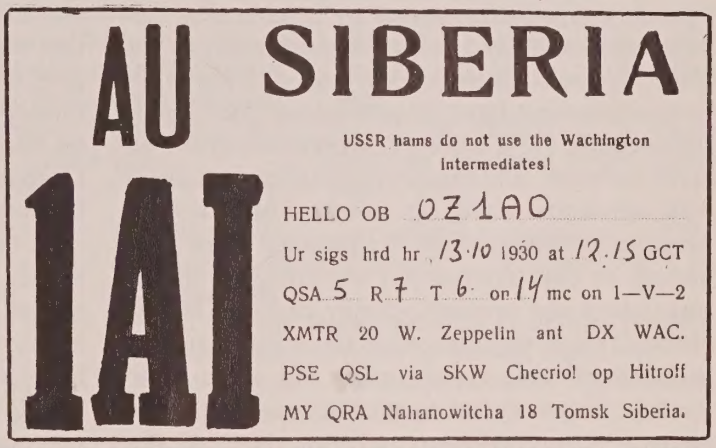
The Washington agreement was not always observed. The rare AU1AI QSL from 1930 is an example. It was sent to AWA by John Stokes (Auckland, New Zealand). It is particularly interesting since the sender was still using the prefix "AU" (Asia-USSR), and as a holdover from earlier times used "OZ" (Oceania - New Zealand) when it should have been ZL, the new prefix. Note the defiant declaration "USSR hams do not use the Wachington [sic] intermediates." I know Zedders were using ZL in 1930, since I used to work them in the morning before I went to school.

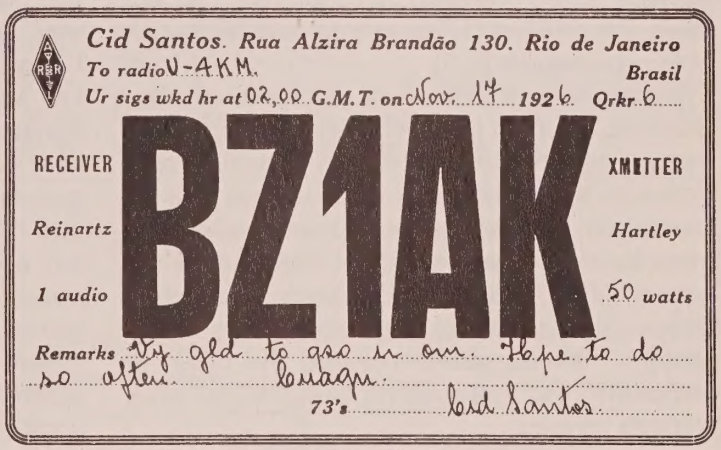
1926 BRAZILIAN CARD - BZ1AK

The owner of this station selected the prefix BZ instead of SB. Note that the card is made out to U. S. amateur U-4KM.

1928 JAPANESE CARD - JXIX

Note that his former call was AJ-3AA. W2XAF was the General Electric experimental station outside Schenectady. Receiver: a detector with one stage of audio and Baldwin headphones. Transmitter: CX-310 tube in Hartley circuit.





HISTORICAL REMARKS ON LOCAL-OSCILLATOR RADIATION

Edward W. Herold
332 Riverside Dr. E, Princeton, NJ 08540-5414

My first experience with what might be called local-oscillator radiation came in 1920, when I graduated from using a non-radiating crystal detector to a one-tube regenerative receiver. In those days of amateur radio, we adjusted our (aptly named) "tickler" feedback coil just barely over the edge of oscillation, so we could self-heterodyne fellow hams who were using CW. I suppose that we realized our receivers were radiating a microwatt or so but seldom gave this much thought.

A few years later, when regenerative receivers were first sold to the public for broadcast reception, there were complaints of heterodyne squeals and whistles caused by neighboring misadjusted sets allowed to oscillate vigorously by unskilled laymen. Such sets were soon displaced by neutrodynes and, later, by screened-grid RF amplification. By 1933, however, superheterodynes became universal, and they included a local oscillator with substantial ability to radiate. In broadcast-band sets, intermediate frequencies were high enough so that input-circuit selectivity (or an RF stage) kept the amount actually radiated well in check. This slowly changed as more and more sets included all-wave tuners using the same intermediate frequency but signal frequencies 20 times higher. Local-oscillator radiation now became more of a problem [1] but was given publicity only in foreign journals [2, 3].

During my own 1930s work on superheterodyne reception, I turned local-oscillator radiation to advantage by inventing a two-way communication system in which each local oscillator was also the transmitter, i. e. the transmitted and received frequencies were separated by the intermediate frequency [4]. This had advantages, particularly eliminating the need for frequency stability at both stations. If one station received the other, its transmitter was automatically tuned to the other station's receiver.

In the winter of 1942, the problem of undesired local-oscillator radiation was brought home to me in a most unusual way. The U. S. was now at war and RCA had just transferred me from the Harrison, New Jersey, plant to the new laboratories at Princeton. I brought with me the home-made TV receiver which had worked well in my prior home, only 14 miles from the New York City TV broadcasts. As expected, signals in the Princeton area were much weaker but were acceptable with a good antenna. There were only a few thousand TV sets in the entire U. S. at this time because the FCC had stopped commercial sales, which did not resume until well after V-J Day. Nevertheless, transmissions from New York continued all through the war.

The two channels I used most were Channel 1, at that time 50-56 MHz, and Channel 2, then 60-66 MHz. What became a real puzzle was that, once in a while, my Channel 2 picture was peculiarly deteriorated and actually reversed in polarity, i. e., like looking at very poor negative. Kingston, my new home just outside of Princeton, was a small town with about a hundred houses concentrated in a few hundred acres. One night, I had a call from a neighbor about a quarter-mile away who said he had noticed my TV antenna and said he also had one of the very few TV sets in use. He suggested that we compare notes on our reception. That gave me a clue and the next time I experienced the mysterious negative picture I called him to see if he also saw it. It turned out that he was using Channel 1 while I was on Channel 2. As soon as he changed to Channel 2, my picture cleared up.

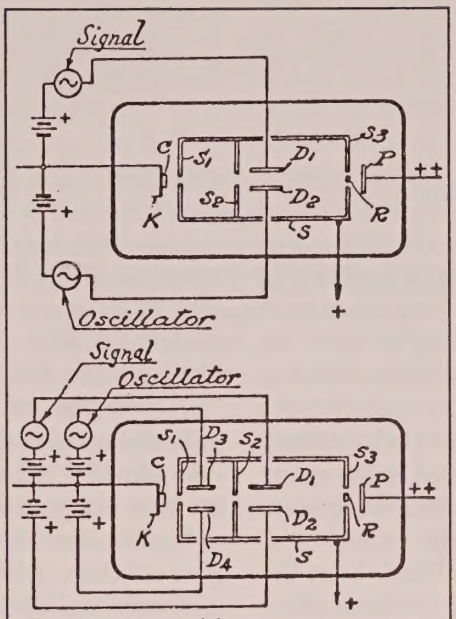
At that time, the usual local-oscillator frequency was 12.75 MHz above the picture carrier. That meant his oscillator from Channel 1 was at 64 MHz, well within the Channel 2 band, just 2.75 MHz above my picture carrier. Our receivers had no RF stage and probably radiated a few hundred microwatts, enough to cause the problem. However, the negative picture had yet to be explained. I knew what video interference should look like: low frequencies caused horizontal bars and high frequencies vertical transitions, often a herringbone pattern. In this case, I failed to notice any pattern, probably because the resolution of the picture tube was too poor. I was heavily involved in war work - more on this later - but finally completed an analysis and confirmed it with experiments. What I found was that an almost invisible interference at the high end of the video band would reduce contrast and, if strong enough, would actually reverse the picture.* My paper on the subject appeared in the first issue of the *RCA Review* to appear after the war in April 1946 [5], in time, I hoped, to affect future set designs. As to my neighbor and me, it wasn't so often that Channels 1 and 2 were on at the same time and we managed to cooperate throughout the war years.

As it happened, oscillator radiation became very important in World War II military operations because radar-frequency receivers had no RF stage

* Strictly speaking, the picture reversal depended on a DC restorer that operated on the average of the sync pulses. With a peak-operated restorer, only contrast was lost and there was no reversal.

and used crystal mixers. The result was that ships, to prevent detection, had to turn off all receivers except when needed for their own radars. Unfortunately, this also kept them from intercepting enemy radiations, i. e., it was a no-win situation. There was a great demand for a non-radiating superheterodyne mixer and, at RCA Laboratories, that's just what we hoped to provide. This project kept me, and a half-dozen other engineers, with plenty to do during the war years.

Our work was based on a radical departure from the conventional grid-controlled electron tube, by using a deflected-beam principle. The work was started by G. R. Kilgore as an amplifier project to reduce the DC current for an electron multiplier [6]. We then added a new idea on frequency conversion that I had invented [7, 8]. The result was a double-deflection beam tube that virtually eliminated local-oscillator radiation and gave much better signal-to-noise performance than crystal mixers up to 1000 MHz [9].



Phase-reversal frequency conversion in a beam-deflection mixer. The lower figure is the low-radiation version. From U. S. Pat. 2,294,659.

The beam-deflection mixer tube came too late in the war to get large-scale production, but we hoped it would help to open up the UHF band for television after the war. However, VHF became so popular and profitable that UHF lagged far behind. Furthermore, our tube was very expensive to produce and, when UHF finally succeeded, advances in tubes and solid-state technology made our work of historical interest only.

Today, spurious radiations are well understood, are strictly regulated, and seldom give trouble. It wasn't always so.

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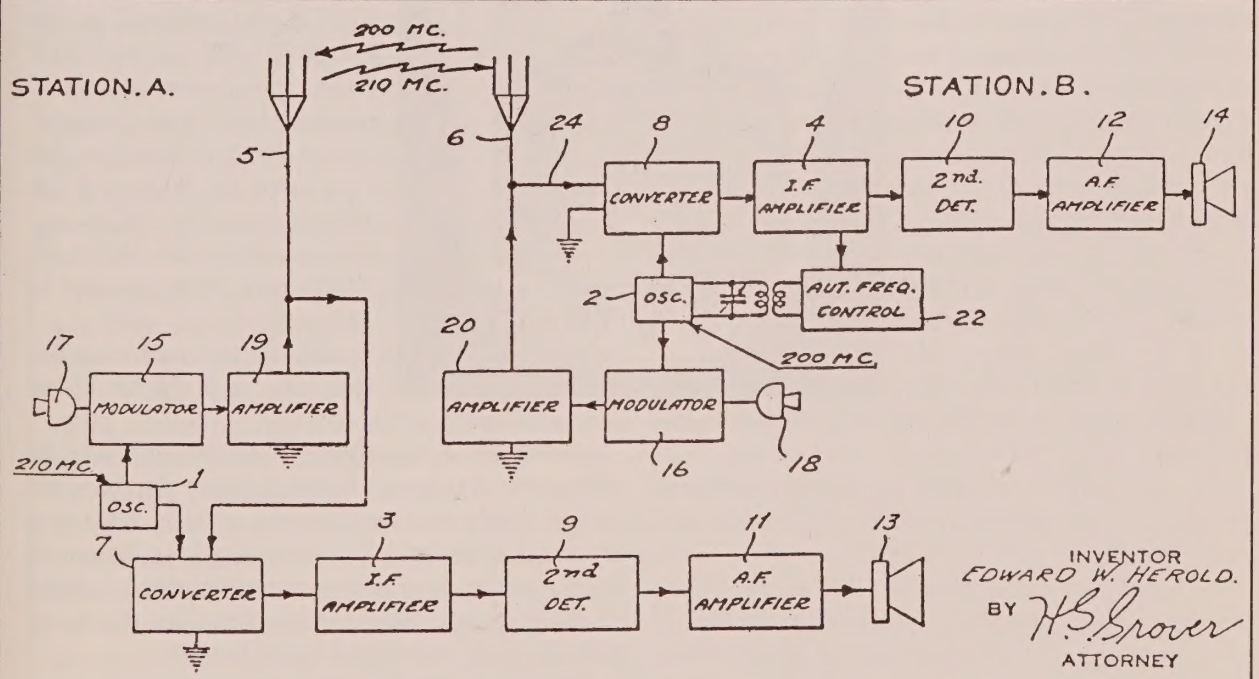
6. G.R. Kilgore, "Beam-Deflection Control for Amplifier Tubes," *RCA Review*, Vol. 8, pp. 480-485, Sept. 1947.
7. E. W. Herold, U. S. Patent 2,294,659. Filed May 17, 1941, Issued Sept. 1, 1942.
8. E. W. Herold, "Superheterodyne Frequency Conversion by Phase-Reversal Modulation," *Proc. IRE*, Vol. 34, pp. 184P-198P, Apr. 1946.
9. E. W. Herold and C. W. Mueller, "Beam-Deflection Mixer Tubes for UHF," *Electronics*, Vol. 22, pp. 76-80, May 1949. [Includes the little-known 1636 tube.]



Making use of local-oscillator radiation. From U. S. Pat. 2,333,719.

THE UNIQUE 4E27 POWER PENTODE

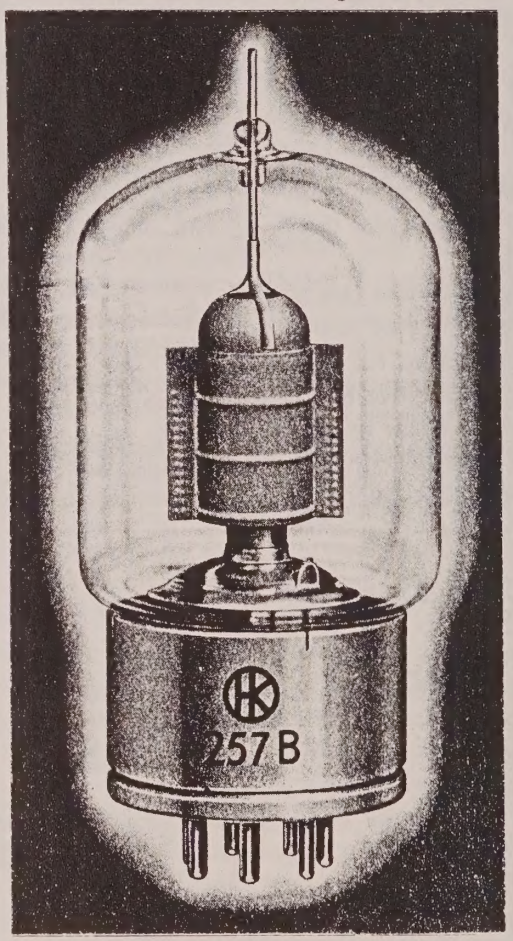
Winfield G. Wagener, W6VQD

185-D Towne Rd., Sequim, WA 98382

Up to about 1930, power vacuum tubes were triodes or tetrodes, namely three- or four-element tubes. The triode consisted of an electron-emitter, a controlling grid, and the electron collector or plate. Unfortunately, there was considerable capacitance between the plate and the control grid, which allowed radio-frequency feedback from the output circuit to the input. This feedback often caused self-oscillation, at either the desired frequency or at parasitic frequencies. To minimize this problem, neutralizing and parasitic-suppressing circuits were required.

By putting a fourth or screening element between the plate and control grid, these problems are reduced by lowering the feedback capacitance.

A fifth element, inserted between the screen and plate and called the suppressor grid, offers additional improvements. Operating at or near filament potential, this grid suppresses secondary electrons splashed out at low velocity from the plate. These electrons, if not controlled, would be drawn back to the screen grid, or into the primary electron stream. They disturb the fundamental-frequency component of the plate-current pulse, thereby reducing the overall efficiency of the tube. Also, this third grid further reduces the feedback capacitance, helping the self-oscillation problem.



In RF power tubes there remained additional problems in the simple action of triodes and tetrodes due to:

1. Secondary electrons emitted when the primary electrons hit the plate, internal insulators, the glass envelope, or incidental bits of metal within the tube.
2. The inductance in the supporting lead wires of the grid, screen and plate.
3. High grid and screen currents due to inability to focus the primary electron beam.
4. Metallic "gettering" material evaporated onto the glass bulb and insulating materials.
5. The chemistry and internal ion flow of the glass envelope, especially at high temperatures.

Secondary electrons can cause overheating of both metal areas and insulators, in addition to upsetting the desired RF component of each cycle of the plate current. The overheating often appears as a local brilliant spot on the surface of an insulator. Overheating of the insulators and glass envelope releases gases that disturb the vacuum.

In 1939, as Chief Engineer of the tube department at Heintz and Kaufman, I designed a five-element tube, or power pentode, to minimize the troublesome effects above. The resulting 75-watt beam pentode was designated HK-257. Shortened by 3/4," it was released as the HK-257B/8001 in mid-1941. Later the industry-standard number 4E27 was assigned. Other numbers used for this tube were GL-8001 and 7B. Development by RCA and Eimac yielded the 4E27A/5-125B about 1950, uprated to 125 watts.

The cause and cure for each of the problems above are as follows:

1. What are secondary electrons and why do they cause problems? When primary electrons are drawn to any surface material with an attracting potential of 50 volts or more, these fast electrons are turned back or redirected at velocities related to their speed. This creates the more damaging secondary-electron flows found in tubes.

The number and energy of secondary electrons emitted varies with the chemical makeup of the

surface material involved. Such a target may be a metal or an insulator. Under common conditions, the number of electrons splashed out may exceed the number of primary electrons arriving. This leaves the surface more positively charged than it was before being hit by the arriving electrons. This process is cumulative and the surface becomes more positively charged, up to a potential slightly less than the voltage of some tube element drawing the secondaries away. Thus, an insulator such as the glass envelope can rise to nearly the highest potential present, generally the plate voltage. The magnitude of this action is limited to those electrons that are not focused to the proper collecting element, such as the plate. The cure is to design a tube electronically and mechanically so that *no* primary electrons can escape the main electron flow from cathode to plate.

2. The incidental inductance of the supporting leads of the tube electrodes is a factor encouraging feedback in conjunction with the feedback capacitance. The lower the inductance, the less an electrode can swing at a disturbing RF potential. Such leads should be short, and of large diameter, or may be several leads in parallel.

3. In the 4E27, both electrical and mechanical configurations were designed to minimize negative secondary-emission effects. To focus the primary electron stream from the emitter to the plate, vertical bars around the helical filament were used to support the three grids. These bars were configured and aligned to focus the electron stream to the plate. In addition, DC voltages applied to each grid were established to assure that the peak control-grid voltage during an RF cycle was less than the space potential from the screen voltage. The resulting field shape provides a lens action, focusing the electrons away from the grid bars.

4. In tubes such as the "Pacific Coast" types (e. g., Heintz & Kaufman and Eimac), the gettering action to chemically bind damaging gases released from hot surfaces is confined to the plate itself. No sputtered getter coating is allowed on the glass envelope to invite uncontrolled secondary-emitting surfaces or induce RF currents on the metal film of the glass. By incorporating the gas-collecting action of a well out-gassed tantalum plate (later, zirconium coating on molybdenum), the disturbing getter was eliminated.

By mounting all the grids on multiple leads, a rigid mounting is provided without internal insulators. Omission of insulators removes sources of secondary-electron heating, and the associated release of gases.

5. It is not generally known that glass is a frozen solution and that migration of ions and chemical compounds can occur in it. At hot-bulb operating temperatures, under the action of high plate voltage, positive metallic ions migrate in the glass to the more negative lead wires. Delicate joints can be broken and the glass cracked.

SUMMARY

In the 4E27 pentode all five electrodes are mounted on short multiple leads with no internal insulator. The filament and plate are cylindrical and all grids are aligned vertical bars. The lower end of the plate is long enough, and the top of the plate is capped, so that no electrons can be drawn out of the active electrode areas.

The grid, screen and suppressor are mounted on multiple leads from the base of the tube. The screen and suppressor leads carry shield cones matching the external equipment shields, completing the RF shielding. This design minimized the chance for secondary electrons to be created and upset the shape of the RF pulse.

At each element lead-in through the glass, a metallic coating in contact with the glass and lead-in material was used to intercept migrating metallic deposits, thus reducing glass cracking at the lead-in points.

Tube construction with no internal insulator and with use of the plate as getter permitted the tube to be exhausted at very high internal temperatures. This reduced materials outgassing, preserving the vacuum during normal operation.

These design features gave a rugged tube with high efficiency and long operational life.

The 4E27 is unusual in having been a power *pentode* in a world of power *tetrodes*; at one time it was Eimac's only pentode. It gave remarkably high power gain: 375 watts out with only 2 watts of drive. The plate ran cherry-red at full power.

This tube was probably first applied in "A Bandswitching 200 Watt Amplifier" (*Radio*, January 1940), since the staff of that magazine had close relations with H & K. It appeared soon after in the Link Radio 1505A communications transmitter and as a predriver in the Radio Engineering Labs 521 50-kW FM broadcast transmitter. The 4E27 went to war, in pairs, triples, and quads, in a variety of VHF beacon transmitters (BC-751, SCR-629, AN/CRN-10, AN/MRN-1), and flew over hostile territory in the AM-16/APT-2 radar jammer. Postwar, it served as the predriver in the Western Electric LD-T2 HF transmitter for overseas telephone circuits.

The tube was rated for full power up to 75 MHz, making it better suited to prewar FM broadcast use (42-50 MHz) than to postwar (88-108 MHz). Likewise, it was well adapted to low-band two-way radio but not to high-band. Nevertheless, it stayed in the RCA and Eimac product lines until at least 1970, and was offered in the Richardson Electronics catalog just a couple of years ago.

WHEN IS A TUBE BAD?

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Over the last few years, I have had numerous inquiries about tubes. The nature of these questions indicates that the younger generation of electronics and antique-radio enthusiasts do not have a good understanding of vacuum tubes. We old-timers grew up with tubes, designing and repairing tube equipment. We are comfortable with tubes and understand their behavior and peculiarities. Books can teach theory, but there is no substitute for experience. Unless we pass on our experience (at the risk of boring some readers), it will be lost.

Anyone working with vacuum-tube equipment should know some tube theory. Reference 1 is a good source of abbreviated theory, but for a thorough discussion, Refs. 2 and 3 are unsurpassed.

There are a lot of things that can go wrong in a tube: open or intermittent filament, interelectrode shorts, noise and microphonics, and poor emission or low transconductance (a "weak" tube). Many of these defects are discussed in Refs. 4 and 5; some can even be cured. I have never had any luck, however, in restoring the emission of a weak tube.

There seems to be more confusion about weak tubes than any other defect. Questions I get are, "Can a tube that tests weak still be used? Should I buy a new tube to replace a weak one, and will it make a difference in performance? Can a gassy tube be used?" These are good questions, considering the cost of antique tubes, and they deserve good answers.

The novice is inclined to test the tubes in a set, replace the weak ones, expect miracles and be disappointed. In the servicing business, we routinely tested and replaced weak tubes, knowing that the set would not play any better unless the tubes were almost dead. We did it because the customer seemed to want and expect it, because tube sales were a source of profit, and because we did not want to risk having the set returned in a few weeks due to failure of one of the old tubes.

Let's consider some elementary tube theory relating to transconductance and emission. Transconductance (g_m) is the figure of merit for tubes. It is the ratio of the change in plate current to a change in grid voltage, expressed in units of conductance, μmhos. Numerically, g_m (μmhos) equals ($\blacktriangle$mA/$\blacktriangle$V) X 1000. In small tubes such as RF, IF and AF voltage amplifiers, the loss of g_m with age is not usually noticeable because most receivers have a large reserve of gain. Power tubes are another matter, as we shall see.

Emission is the property which most inexpensive testers measure. Plate current is measured under a fairly heavy, but not excessive, load and related to the current of the average new tube on a 0-100 meter scale.

It is necessary for our discussion that the reader understand how the electron emitter (cathode) in a tube works. *Electrons do not go directly from the cathode to the anode.* The cathode is designed to emit far more electrons than are required to support the plate current. These excess electrons form a cloud around the cathode (space charge), and plate current is drawn from the space charge. To quote from Reference 2, "The space charge is like a reservoir of water that supplies varying requirements, but is itself replenished at an average rate. It forms a protection to the cathode coating against bombardment and high electrostatic fields . . . and limits the current which would otherwise be drawn by a positive anode voltage." We can see that, as long as the emission is sufficient to create a space charge under the conditions imposed on the tube by the set design, it will operate satisfactorily. When the cathode or filament is exhausted, the plate current is no longer limited by the space charge, but by the cathode temperature. This is why raising the filament voltage a notch will dramatically increase the emission reading on a weak tube, but has little effect on a good tube. Small-signal tubes are much more tolerant of reduced emission than rectifiers and power amplifiers which must carry large currents. Some experimen-

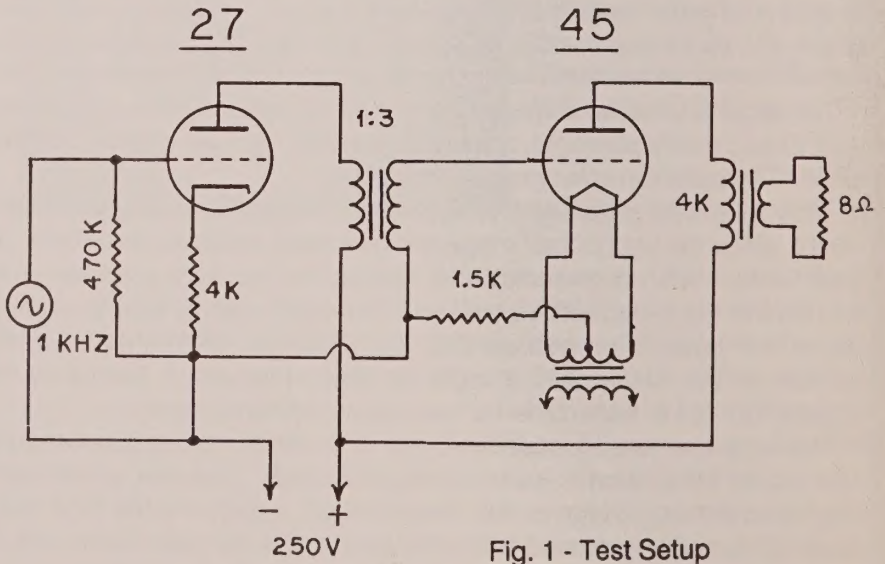

Fig. 1 - Test Setup

tal data will illustrate this point.

Nine used Type 45 output triodes were tested for emission and g_m. Each tube was then tested in the circuit shown in Figure 1. A one-kHz sine wave was applied to the input and the output across the load resistor viewed on a 'scope. Signal was increased until clipping occurred. The power output at this point was calculated from the RMS voltage developed across the load resistor. The data are shown in the table below. There is a clear relationship between g_m or emission and maximum undistorted power output. Figure 2 shows the least-squares fit of output vs. emission. The correlation coefficient is 0.991. The correlation coefficient of g_m vs. output is 0.993. It follows that g_m and emission must also correlate with a coefficient of 0.979. For non-statisticians, a coefficient of 1.0 is a perfect correlation.

Tube	g_m	Emission	Output, mW
A	2400	95	656
B	2300	94	611
C	1700	83	475
D	1800	89	490
E	1300	73	340
F	800	52	123
G	400	37	16
H	800	56	174
J	2500	98	644 (gassy)

Of the tubes listed in the table, all are usable except G and J. Tubes F and H have very low output, but are adequate for ordinary listening. Remember that the average AC-DC set puts out only ~500 mW at full volume. Tube G is worn out and tube J is gassy. Gassy tubes are discussed below. In push-pull output stages, balance must be considered. It would not be a good idea to use tubes A and F in a push-pull stage because there would be serious unbalance; however, they would work.

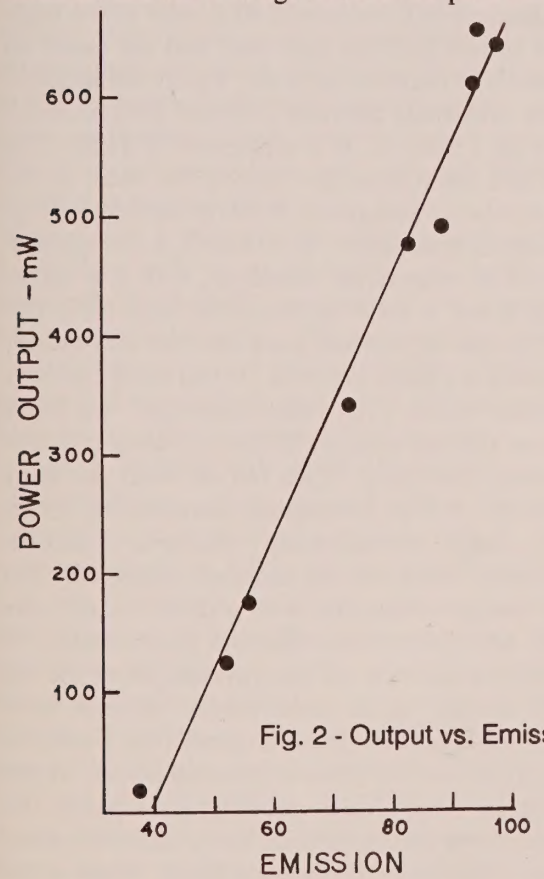

Fig. 2 - Output vs. Emission

The circuit of Figure 1 was also used to test 17 used and new Type 27 tubes for gain. Input from the generator was set at 1.0 volt RMS and the voltage across the secondary of the interstage transformer measured with no tube in the 45 socket. There was no correlation between gain and g_m or emission, reinforcing the conclusion that tube testing is not a reliable predictor of performance except for power tubes. If in doubt, the best course is to substitute a known good tube for the weak one to see if it makes a difference.

The effect of gas in a tube is to increase the plate current and the apparent g_m or emission reading on a tester. When electrons collide with gas atoms, additional electrons are ejected from the atoms, leaving positive gas ions. The additional electrons go to the plate, adding to the total plate current. Worse yet, the gas ions neutralize part of the space charge, decreasing its protective effect and increasing the cathode current for a given plate voltage.

The positive ions also bombard the negative grid, where they are neutralized by acquiring electrons. These electrons must flow into the grid from the ground, creating a reverse grid current. If the grid return has high resistance, as in an R-C coupled output stage, the grid can go quite positive and lose control over the plate current. Normally a tiny grid current flows the other way because a few electrons strike the grid and flow out to ground. Grid current is virtually unmeasurable in a good receiving tube. Tube J in Table 1 had a grid current of 7 μA; the rest measured zero.

Although tube J is only slightly gassy and will work, gassy power tubes are dangerous and should never be used. The amount of gas may increase to the point where the plate and grid currents become excessive, risking damage to the output transformer and power supply. Never omit the gas test when you are testing tubes.

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3. Pender, H., and McIlwain, K., Electrical Engineers' Handbook - Communication and Electronics (New York: John Wiley, 1950), Chap. 4.

4. Sibley, L. A., "Restoring Vacuum Tubes," *OTB*, Vol. 31, No. 2 (Aug. 1990), pp. 25-26.

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TRANSISTORLAND: PRICES, PRICE GUIDES & VIDEOTAPE

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PLASTIC GOLD

Among the responses to my article ("Transistor Radios - Mature At Last," *OTB*, Nov. 1992), the question most frequently asked, by far, was "what's it worth?" This, of course, in reference to a specific transistor radio. My reaction inevitably was to ascertain the make, model, color and physical condition. I followed this with questions relating to performance, papers and packaging. All these factors are basic to a proper cost evaluation. There are other important considerations, such as the current popularity of a given model, its historical significance, the country of origin, the materials from which it is made (leather, plastic, metal, etc.), and in some cases, like the extremely popular 1955 hand-wired Zenith Royal 500s, the matter of which chassis was used. (This first Zenith transistor radio came in two colors and three chassis versions.) The point is that many elements determine the final price (or trade value) of a given transistor radio at a specific time. And to really get a handle on current costs, you must continuously update your education, else you will inevitably give your best radios away.

A TR-1 MEANS EXTRA FUN

Per the norm, there exists one exception to all rules, the must-have Regency TR-1. This always costly 1954 classic came in six colors: black (the most common), red (almost as common), white (still comparatively easy to find), gray (haven't seen one yet), and the killers: marbleized green (sometimes so lightly marbled that it looks solid) and mahogany (marbleized brown). You should know that the latter sets are a class apart, commanding prices that currently run $1500-3000. By comparison, a fine black set may still be had from semi-knowledgeable sources for as little as $200, but more often about $400. Other colors cost more, rising to about $1000 for mint examples in the box. The TR-1G, a revision of the TR-1, can be almost as costly, but because it was not the "first," remains something of an enigma to value properly. And the TR-4 (a slightly reworked 9-volt version of the TR-1) is rapidly gaining in popularity and cost, running about $300 for a near-mint to mint set. Again, color is the key to the big bucks. The TR-1 is the exception because none are cheap, not even parts sets, and by the time you read this their prices may be even higher as they and their offspring continue to defy all sensibilities, seemingly regardless of condition.

LATE CAN BE GREAT
BUT WHY DID RAYTHEON WAIT?

The second company to market transistor radios was in the business only a short time. Still, in its two-year run, Raytheon produced four different sets, of which three are highly prized. The company's first product, a leather-cased model, is a pricey number frequently running into the multi-hundred dollar range but its two plastic models command the really big bucks. While not as dear as the TR-1s (what a difference a few months make!), the models T-100 and T-150 in mint condition are worth about half of an AK 10 breadboard. The 2500 (the world's first "boom-box") is a large set that hasn't found its niche, so unless you're offered a TR-1 hold on to it for a while.

MORE GOLDEN OLDIES

Also at the top of the collectability heap are pink and tan Zenith 500s; RCA's first model, the 7-BT-9J; anything solar-powered; Sony TR55s, TR72s and TR63s; and virtually any 1955 set in mint condition, especially if it's NIB. I should also mention the ubiquitous Emerson 888 series which came in four basic models and any number of colors. These sets, which generally go at radio meets for $75 in average condition, push the big numbers button when near-mint to NIB.

AVOIDING CRISIS WITH PROPER PRICES

That said, let's get to how I evaluate the worth of a collectible transistor radio. Others, of course, will disagree but I've parted with most of the high-ticket radios sold this past year and am called on almost daily to price out a set. By my definition, if a radio was made between 1954 and 1962-63 and if it's NIB, I value it at a minimum of $125. The whys are numerous but include *the value of the time it takes to find goods in this condition* and that the unit IS brand-new. If a radio is a first-generation set in reasonable condition, with few exceptions, it has a value to me of at least $150-200. Add to this restoration costs and the sets quickly approach the $250-300 level. If you think I'm nuts, take the "Mister Transistor Challenge." Go find a mint or NIB set made in 1955 and restore it to new "working" condition. Then tell me what you think it's worth. If a set is especially attractive by dint of color, design, workmanship - whatever - add for that. Most black sets are just that: black sets. But they change remarkably with a dash of color, like Clark Kent before and after the phone booth. If no one you call can tell you anything about the set, that's usually worth extra money because most seasoned collectors know a great deal about almost every set out there in Transistorland. If you "stump the band" you've probably got a goody. Of course, there are exceptions, like a brass-and-wood encased Raytheon T-100 I was given. None of the

usual crew of hard-core collectors knew anything more than that a few exist and that the cabinet came from Switzerland. This talks to the importance of knowing a radio's history, and to style and desirability. We all knew that Raytheon made the chassis but that was all. And we generally agreed that, although it was a nice and interesting piece, it wasn't worth much. This is not generally the case for oddballs but is offered as the exception to prove the rule. So if you have an early set in great shape and nobody knows anything about it, you probably have a winner - except if it's a brass-and-wood Raytheon.

CASH IN THE TRASH

The dollar value of the original papers and box should not be underestimated. One collector I spoke to recently told me he ups his price 50% if he has all the goodies. I generally place the increase in value at about $100. The one area of total agreement is that papers and box add significantly to the value of a radio. So, too, does having any special accessories. These might be as mundane as the original leather case and earphone or as exotic as an extra-cost solar battery or speaker module. Given that few sets were marketed with the extremely costly solar packs, don't fret if you locate a "fun-in-the-sun" job without it. One model, a 1956 Admiral 7L16, is in a few collectors' hands but nobody seems to have the leather case and battery pack for it. This is easily explained if you consider that in 1956 the accessories cost a hefty $175, versus $55 for the radio itself.

YA GOTTA BE IN IT TO WIN IT

So far, I've recounted most of the elements that influence current pricing but only hands-on experience in the market will make you an expert. And unless you remain actively involved in cost fluctuations on a daily basis you will soon fall behind. The market *is* that volatile.

One reason is that there are two distinct groups of buyers of early transistor radios: the true collectors, who basically buy or trade at lower prices, and the nostalgia fans. The demand stemming from the latter group is driving the cost of superb examples of these sets higher every day and is the skyrocketing growth segment of the market.

WHY TO HIDE ANY NEW PRICE GUIDE

In view of this, I have declined several requests to produce a price guide to transistor radios. Since others may do so, I offer the following thoughts. First, we all share a hate/love relationship with these volumes. If an author relates a price that benefits us, the guide is great. And if a quoted price seems right or reflects a recent sale, we feel relieved. But when an antiques dealer whips out a price guide and tries to put it to us we disdain the tome and curse the author. In other fields of collection, maturity and sheer size stabilize the numbers. Camera collectors use price guides that are reasonably accurate due to the stability of the marketplace. This is true for coin and stamp collectors as well. But there are far fewer radio collectors and we've been at it for a lot less time. Thus there are fewer transactions on which to base a value. This is even more the case in *transistor* collecting. As a result, any price guide is suspect from the get-go. The core group of transistor collectors is small, well under 100. And I suspect that this group has not been polled to determine if there is any agreement as to specific prices. That said, I believe that no price guide, regardless of how well intentioned, can be even remotely accurate. If, however, it is properly researched, the volume should be valuable for identifying and dating radios. And with the wealth of source information available, there can be no excuse for inaccuracies. If I sound like I'm beating up on price guides and especially those to come, you're right. But that's because over the past few months I have seen prices rise in some cases by hundreds of dollars (sometimes in a matter of days) on many highly collectible sets. And other variables influence prices. For example, various collectors apply different rules to the impairments of chips, cracks, dings, dents and other damage. As there is no standard among collectors to cover this problem, and since restoration is still an object of discussion, one cannot make rules as to the outcome of these issues. I view a "mint" set as flawless and working perfectly. Others seek only physical perfection, while some collectors insist a "mint" set must be NIB.

WHEN VIDEO MEETS RADIO

On page 79 of the December issue of *A. R. C.*, Bill Burkett, a respected and seasoned transistor-radio collector, announced a "Brand new professionally produced video. Collecting Early Transistor Radios, narrated by Bill Burkett." The cost of this two-hour presentation is a modest $19.95 delivered. So far so good. In fact I was so delighted by what the ad promised that I phoned Bill and obtained a review copy immediately. I have viewed the tape twice and will comment in some detail shortly. Before my critique, however, let me without equivocation recommend that you order this cassette if you have any interest in transistor radios whatsoever.

That's the good news. The bad news is this is a strictly amateur production accomplished with genuine love, a healthy dollop of knowledge, and no production values at all. If Cecil B. DeMille were alive he would not be terribly concernd about his future. Shot, according to Bill, by a "professional" videographer on high-band 8, the visual quality of the production is third-rate. Picture quality is often fuzzy at best. Closeups which are sorely needed are almost always out of focus. The audio is okay except when Bill removes his pen.

This device is used as a pointer and occasionally scrapes the mic, producing a grating sound guaranteed to wake Marconi. An overzealous Burkett spends most of the first 30 minutes showing every aspect of the 17 TR-1s and variations of same that he owns. Therefore it is wise to keep your finger on the fast-forward button and apply pressure after five minutes. When he finally emerges from TR-1 Heaven, Bill finds his pace and the tape becomes an interesting and lively review of many of the most important and collectible transistor radios. For reasons known only to Burkett, he tends to skirt Emerson radios, strange considering the popularity of many of its models, including the 888 series. Since the medium shots are generally in focus, you will get to see most of these sets clearly, albeit at a distance. And you will get a real sense of what's out there and what this hobby is all about. Norm Smith's tape has been shown at the Rochester AWA conference, but Bill marketed his video first. In doing so, Burkett has created an interesting new educational vehicle. That is the broad-scale show-and-tell approach many serious collectors can bring to the fore. I know of no other commercially available tape of an extensive radio collection in any category. This, then, is a pioneering effort and Bill is to be commended for producing and selling it, especially at a low price. Where he is to be chastised is in failure to use high-quality recording and duplication. But perhaps if he had, the price would have risen too high, so we must live with this trade-off. Some scenes in the tape are genuinely funny, especially the one, not edited out, where he instructs his cameraman to stop taping. And because he is a collector and not a pro, Bill himself lends a certain charm to the presentation. You can actually witness him settle into his performance as the show progresses. Still, the bottom line is that this is a must-have. Burkett's tape is the only game in town, the price is right, he cares and he shows what needs to be seen. The tape is available from Bill Burkett at PO Box 1204, Peoria, AZ 85380, (602) 878-7386. I recommend you order the tape and that we all support a fellow collector in this ground-breaking venture. And if you really want to see many of the sets clearly and obtain a superb background to transistor collecting, Mike Schiffer's The Portable Radio in American Life is a must-read.

OVER AND OUT

That's it for now, kids, so keep those calls and article ideas coming in [to (201) 585-0030; fax (201) 585-1659], but please hold the letters. Still, if you must write, at least include your phone number.

(Continued from p. 6)

Write or phone (don't send money): Bruce Kelley, (716) 657-7489, 59 Main St., Bloomfield, NY 14469; or Lauren Peckham, (607) 739-5443, RR1 Box 676, Breesport, NY 14816-9709.

NORTHERN NEW JERSEY MEET

Saturday, May 14

"The Still," Tranquility, NJ, Sussex County Rte. 517, approximately 1.5 mi. north of exit 19 of I-80 (Allamuchy exit), same as last year).

Dinner Friday evening; rooms available at the Panther Valley Motor Inn for those staying over. Flea market and lunheon Saturday. For details, send an SASE to: John Richardt, W2WIY, 94 Bald Eagle, Hackettstown, NJ 07840, (908) 852-3475.

AWA REVIEW

Introduced in the November OTB, Review 7 is available. Its contents, in 192 pp. and 132 illustrations, are shown in the box.

Vols. 1, 2, 3, and 6 are also available - see the November OTB for conents. Price for any volume is $12.50 postpaid (U. S. and Canada; $14 postpaid elsewhere). To order, send a check payable to "Antique Wireless Association" to AWA, 44 E. Main St., Flemington, NJ 08822-1224.

We welcome Antique Radio Classified as a Review supplier. Besides availability from AWA, Vol. 7 and several others are now offered by both A. R. C. and Antique Electronic Supply. These sources offer credit-card convenience and make it easy to get the Review while stocking up on books, tubes, and/or restoration parts. The addresses: Antique Radio Classified, PO Box 2, Carlisle, MA 01741, (508) 371-0512, fax (508) 371-7129; and Antique Electronic Supply, 6221 W. Main St., Tempe, AZ 85282, (602) 820-5411, fax (602) 820-4643.

AWA REVIEW, VOL. 7

- *Ricevitore Popolare Italiano* (The Italian People's Receiver) (Robert Lozier)
- "Memories of Early Electron-Tube Development" (Edward Herold)
- "The First High-Power Transmitter at Poldhu" (Desmond Thackeray)
- "Secret Tubes for Radar: The Western Electric 700-series" (Ludwell Sibley, with appendix by Colin MacKinnon)
- "Military Electronic Equipment Manufacturers - Naval Equipment" (Fred Chesson)
- "A Brief History of the Valve Audio Amplifier" (Carlos Fazano)
- "The Eaton Tube Collection Revisited" (Jerry Vanicek)
- "The Arc Method of Producing Continuous Waves." (William Byron)
- "Robert H. Goddard and the Goddard Oscillator" ("Bud" Hall)
- "The Evolution of Broadcasting from the Transmitter Viewpoint" (author, ca. 1932, unknown).
- "Index and Additions to Patents Lists" (David Kraeuter)

THE RS-6: A SURVIVAL RADIO, FIFTIES-STYLE

The portable transmitter-receiver in the photo is in the collection of Len Geraldi, K6ANP. Little is known of its origin, despite its construction style and parts being obviously American. The design is Fifties-vintage, the newest of the tube types used having been registered with the EIA in 1950.

The transmitter is labeled RT-6, S/N 3383. It is crystal-controlled, CW-only, in two bands, 3.0-7.0 and 7.0-16.5 MHz. Tubes are a 6AG5 oscillator and 2E26 amplifier. The tiny built-in key swings out from a slot in the case. Matching to the antenna is done with a tap switch on the output tank coil, using a neon lamp to observe resonance and a filament-type bulb to estimate antenna current. A keying relay gives break-in operation, with sidetone provided for monitoring the outgoing signal. Output power with the 2E26 would be of the order of 15 watts, properly tuned up.

The receiver is marked RR-6, S/N 3354. It tunes 3.0-6.5 and 6.5-15 MHz, or can be crystal-controlled. The dial is nicely designed with high-resolution logging scales for easy retuning to a particular frequency. Tubes are subminiatures: two 5718 triodes, six 5899 pentodes.

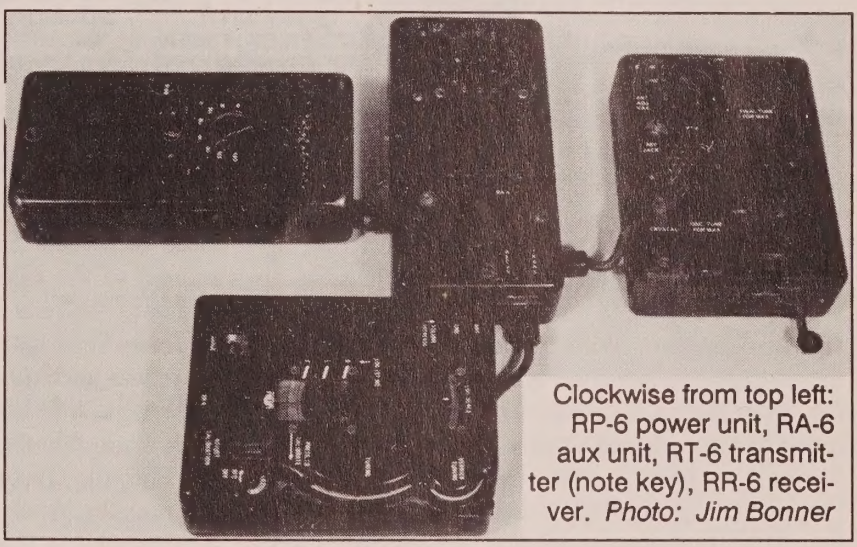
Power comes from an RP-6 unit, S/N 3852. Obviously intended for use *anywhere*, it accepts 70, 95, 120, 150, 190, 230, or 270 volts AC. (At the time, parts of Hungary and Thailand used 100-volt power; areas of Albania, Bulgaria, and Colombia had 150 volts; and sections of Libya used 270 volts.) The AC power cord has two round prongs, European-style. The unit includes a vibrator, will run on a 6-volt battery, and can recharge the battery when operating from AC. The B+ rectifier is a 6X4 giving 400 volts.

An RA-6 filter-accessory unit, S/N 3354, distributes power and regulates the receiver B+ via a pair of 5644 subminiature VR tubes. It provides storage for cords and a tiny hearing-aid style earset. (The sample pictured has had a speaker added.) An instruction label showing how to interconnect the units is designated, like the rest of the set, in US-style English, but carries no other identification.

Each unit is in a black steel case with rounded corners. A watertight plastic pouch protects each unit in transportation. The heaviest unit weighs ten pounds or less. It is clear that this set, with a small antenna/auxiliary kit, can be packed in a highly inconspicuous fashion.

We checked with military expert Hugh Miller, KA7LXY, in hope that he could advise as to the origin and uses of this set. He reports that it was apparently designed as a survival set for B-47 bomber crews, for use if they had to land in hostile territory and call for resue beyond AN/URC-4 UHF range. The set is roughly comparable to the German agent set SE100/11 of WW II vintage, which had three snap-together units.

Hugh came up with a copy of the tech manual for the set, which is formally "Radio Station RS-6." The book is anonymous like the radio itself: format and graphics are straight DoD, even to type fonts, but the wording is quite discreet as to origin or manufacturer. It shows how to operate the set from the Signal Corps GN-38 hand-cranked generator - a bulky WW II relic which spoils the light weight and easy concealment but gives total freedom from other power sources.



Clockwise from top left: RP-6 power unit, RA-6 aux unit, RT-6 transmitter (note key), RR-6 receiver. *Photo: Jim Bonner*

With its universal design, the power unit takes any power frequency, 40 to 400 Hz. Hugh reports that there is also an RS-6A model tuning 4-22 MHz.

The manual mentions that the transmitter will accept an external semiautomatic key or "automatic tape keyer" at up to 60 WPM, which smacks of burst-mode, hard-to-locate operation.

The receiver is a conventional single-conversion job with two 455-kHz IFs. Unusual design techniques are used to improve selectivity: tapped coil windings for less loading by the tube plates, loose coupling between windings, and a triode "plate" detector instead of the usual diode. The BFO is also used as a source of DC bias voltage, and the single audio stage can be made to oscillate as a 500-kHz crystal calibrator.

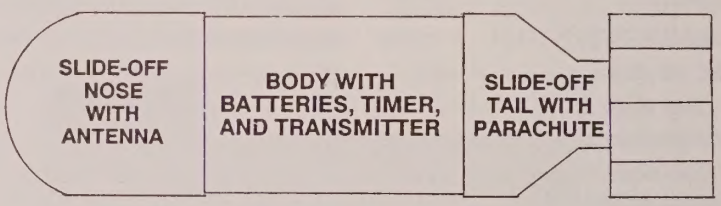
As for Len, he has gotten relatively straightforward use of the set: in portable operation in the Sierra Mountains in California, on 40 meters. (LAS)

RADIO NOISE BY PARACHUTE

Ludwell Sibley, KB2EVN . . .aided by Len Geraldi, K6ANP, and Hugh Miller, KA7LXY

Back in the mid-Fifties, good ol' Standard Surplus in San Francisco displayed a supply of radio jammers, AN/CRT-2, at the store entrance. The price was right for a high-school kid - $2.95, if I remember right. The device obviously had what the Lionel train catalogs of the day called "play value," so I took one home.

What was the CRT-2? In official terms, the letters meant "air transportable (C) . . . radio (R) . . transmitting (T)." Formally defined as a "small expendable jammer to be placed near enemy radios," it was a bomb-shaped object about 10" in diameter and three feet long. Inside the olive-drab sheet-metal body was a group of holders for dry batteries, a 24-hour clock timer, and a spark transmitter. This consisted of a burly interrupter-type spark coil about the size of a one-pound salt can, a nice machined spark gap, and a coil and capacitor. The precise frequency (haw!) is not known, but the size of the coil suggested a few MHz.



The tail section of the "bomb" was designed, upon release from an aircraft, to slide off in the air stream and release a small parachute, perhaps six feet in diameter. With the body suspended from the parachute, the nose section would then slide off, unfurling an antenna. The antenna was a waterproof (tarred) insulated wire a hundred feet or so long, consistent with operation in the low-megahertz region. With luck, the device would fall into trees for concealment and good radiating efficiency.

The tactical use of the device was pretty obvious: to confuse an enemy force in a ground attack, one would drop a few CRT-2s the night before in the vicinity of an important station in the opposition's command network, with timers preset to go on the air at the right hour. Or, to protect a bombing operation, a dozen or so of these devices could be seeded near a receiver station in his Ground-Controlled Intercept system. The resulting broadband radio noise would make it difficult to direct defending fighters against the attacking force. The timer had a tear-off time scale, so that the actual hour of operation was not obvious to someone finding the device.

I took the unit apart - the spark coil made a jim-dandy driver for a Tesla coil. One of my buddies disassembled his for the parachute, which was to be used as a recovery parachute in a solid-fuel rocket project that never got past the talking stage. Some other jolly soul found a novel use for *his* CRT-2: it turned up on the grounds of the local high school. As reported in the local newspaper, school was closed for a morning while the Sixth Army bomb-disposal squad was called in from the Presidio of San Francisco to defuse the "bomb." I suppose it's a testimonial to the openness of American society that ordinary citizens may possess broadband noise jammers that also look like bombs; in this case, there was perhaps a small failure of citizenship . . .

Early in WW II, radios in fighter-interceptor aircraft worked in the low-megahertz range: the British TR9, the German FuG 10, the Japanese Model 99, and the American SCR-183/283/274N radios all operated in this area. Likewise with most tactical networks on the ground. The CRT-2, if initially successful, would have lost value as air and ground forces went to VHF tactical communication. Hence a possible reason for the obscurity of this device.

ON "C" EQUIPMENT

The Army and Navy dropped the initial letter "C" (air transportable) from their "AN" nomenclature system early on, ca. 1944. It's easy to see why: actual uses were so far-reaching as to render the designator quite ambiguous. "C" was used on gear that a fighter pilot wore with his life jacket (the AN/CPT-2 "Walter" emergency beacon). It identified equipment that weighed 50 tons in all, and was lifted carefully out of the airplane (the AN/CPS-1 microwave early-warning radar). It covered sets that were parachute-dropped to friendly troops (the AN/CRC-1, an adaptation of the SCR-522 VHF radio). It also covered stuff that was parachuted toward hostile forces (the AN/CRT-2 above) or hurled down on them (the AN/CPQ-1 proximity fuze for bombs). No wonder the designator lost its meaning! A few more "AN/C--" sets:

CPN-8, S-band radar beacon
CRC-5, SCR-499 HF set, parachute model
CRD-5, Missile-track direction finder
CRN-2, Airport glide-path transmitter
CRT-1, Sonobuoy
CRT-3, "Gibson Girl" liferaft transmitter

MEET THE COLLECTORS

Rodney Schrock, KD3OR
402 Lincoln St., Somerset, PA 15501

SWEEPING THE AM IF

In 1960 or so, I became interested in building some sort of high-performance AM tuner. I used the schematic of an AM radio we built in Navy Electronics School, but instead of using all octal tubes I used a Western Electric 396A oscillator, 6BA6 IF, 6AL5 detector-AVC, 396A first audio - cathode follower, and WE 412A rectifier, the only octal tube remaining being the 6L7 mixer - had I been a little smarter I would have used a 6BE6.

The tuner worked rather well, so I added a 6U5 tuning eye and a 6BA6 RF stage. To minimize any interaction between stages I added WE 306F inductors as well as 0.1 μF bypass condensers in the B+ leads. Later I replaced the 6L7 with a 7F8, which I thought gave a better signal-to-noise ratio. Having studied tube specs I became convinced that the then-new 6GM6 would improve my gain and signal-to-noise ratio and I'm sure this was true as I again noticed a distinct improvement in the tuner's performance. Evidently others felt the same way and measured the results - see the signal-to-noise, noise resistance and transconductance tables on page 17 of the February 1991 issue of *Electric Radio*.

Besides sensitivity and stability, a main concern of mine was selectivity, being that the local AM station is on 990 kHz and KDKA is on 1020. To achieve this I tried different IF transformers - the best of which was a pair of Millens with adjustable coupling. I adjusted these by twist and measured with a signal generator and VTVM - very tedious.

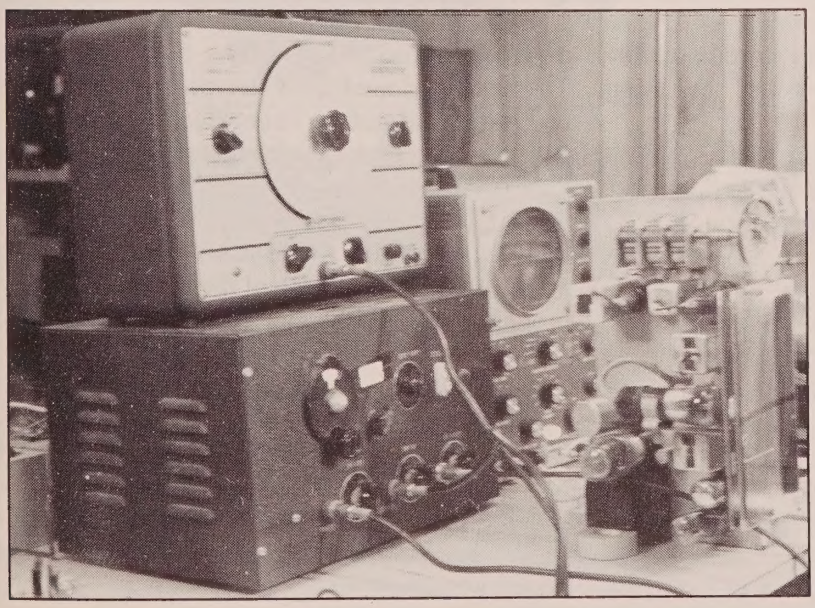
Remembering the AM sweep information in RCA and GE service info in prewar Rider's manuals, I happened across the April 1964 issue of *Radio-Electronics* which featured an article on a 455-kHz AM sweep generator. It uses a 12AU7 swept oscillator/marker generator, a 6U8 reactance modulator/cathode follower, and a 6X4 rectifier. I built one using a WE 100A variable condenser to give a wider range of frequencies.

In order to reach lower frequencies, I changed the tuning inductor to one from an old Western Electric cable test set and provided a switch to cut in shunt condensers to lower the frequency coverage.

The results were pleasing - I was able to sweep the IF of my tuner and adjust the transformers for best results. Results were good; before the local AM station increased its power, I was able to receive a 250-watt daytimer on 1010 kHz from Berkeley Springs, West Virginia, 55 miles away over mountains.

The tuner got me through the Berlin Wall, Cuban Missile Crisis, and the JFK assassination, and was used up into the '70s, when I replaced it with one I built from a 1948-era Magnavox circuit.

If you build the sweeper, stick to the RF choke specified in the *Radio-Electronics* article as the tank inductor. I changed from the choke to the WE inductor and noticed the sine-wave was somewhat distorted but the sweeper gave good results.



After building the sweeper, I found an article for another one in the June 1960 *Electronics World*; it may be worth trying.

The illustration shows the generator in use with a Triplett signal generator providing the desired marker frequency. This test setup is sweeping my present AM tuner.

TELECOMMUNICATION

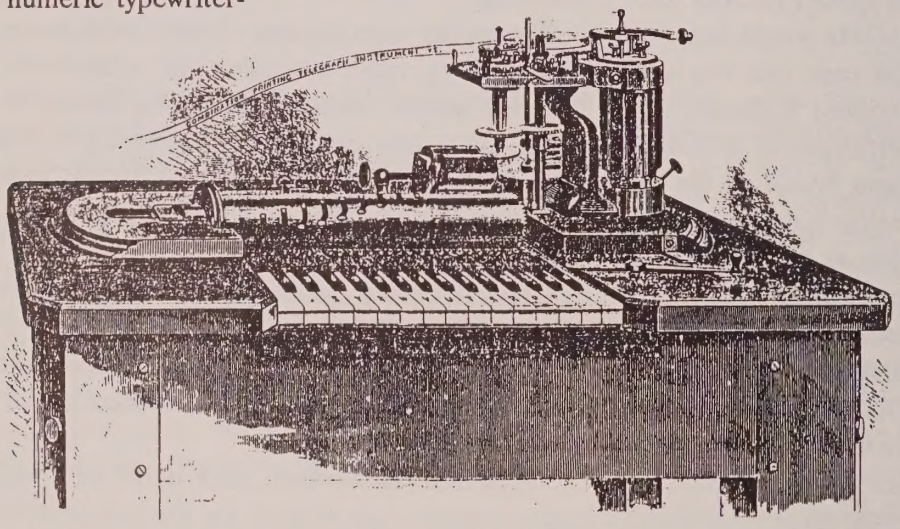
EDITED BY
DON DeNEUF
WA1SPM

THE IMPACT OF THE PRINTING TELEGRAPH

When robots were introduced to replace sizable amounts of semiskilled manpower in the fabrication of automobiles, resentment naturally took place in some quarters. More important was the fact that eventually many workers were forced to learn a new skill or face unemployment.

A similar situation occurred in the telecommunications field when teleprinters began to replace Morse operators and their skill in the use of the telegraph code, circa 1930. Up to this time, a working telegraph circuit required two code operators, one to send the material and the other to receive and transcribe - "copy" - it into written form.

The teleprinter circuit needed only one person to transmit the information. Reception occurred automatically at the far end. The sending operator needed to be proficient only in the use of an alphanumeric typewriter-style keyboard. Messages could be stored and forwarded at intermediate relay points by using punched tape.



Despite this development, the idea of a printing telegraph system had occurred much earlier. Actual working printer-type telegraphs were developed by Wheatstone, House, and Hughes between 1841 and 1850 with varying degrees of success. Phelps developed one about 1860 using features invented by both House and Hughes, calling it the Combination Machine (see figure). It was used rather extensively between Boston and New York City for a couple of years and was capable of passing 2500 words per hour. But all these systems were vulnerable to frequent misoperation due to poor circuits (efficient line insulation was yet to be developed), plus the damaging effects of earth currents and atmospheric discharges which upset the delicate machines. Synchronization was very difficult to maintain in those days. All these systems were eventually dropped in favor of Morse's reliable and rugged manual code method.

But the desire for a printing telegraph was always present. The Associated Press hoped for an eventual system which would "pick up words at one end of the line and would type them out automatically on paper at points all along the line."

Nothing really successful was developed until about 1912, when three Chicago men came up with a solution. Joy Morton (who had made a fortune from salt) supplied the money. Charles L. Krum, a refrigeration engineer, and his son Howard carried out the technical development. They named it the Morkrum machine. AP tried it out on a local New York circuit in 1913. Twenty-two years later, AP replaced its last Morse circuit with teleprinters.

The original Morkrum printer was noisy, but this was remedied by Edward Kleinschmidt's company, which substituted a type basket (common to the conventional typewriter) for the pounding typewheel of the Morkrum. The two concerns soon merged into the Teletype Corporation, which became a subsidiary of Western Electric in 1929. Some years later, Teletype developed the Teletypesetter, using a six-unit tape transmission code which handled upper- and lower-case letters without shifting, permitting linecasting machines at newspapers to "set type" automatically, directly from the wire network.

Today cathode-ray tube (CRT) screens and keyboards, plus computers and digital memories have brought us to another milestone in telecommunications. Within another decade or so, advances in automatic voice recognition and speech generation will surely bring us a practical "voxgraph" - human speech automatically converted into printed words. Such problems as similar phonetics and differences in meanings will be overcome by refinements in "probability selection" and other techniques which will surely be developed.

KEY and TELEGRAPH

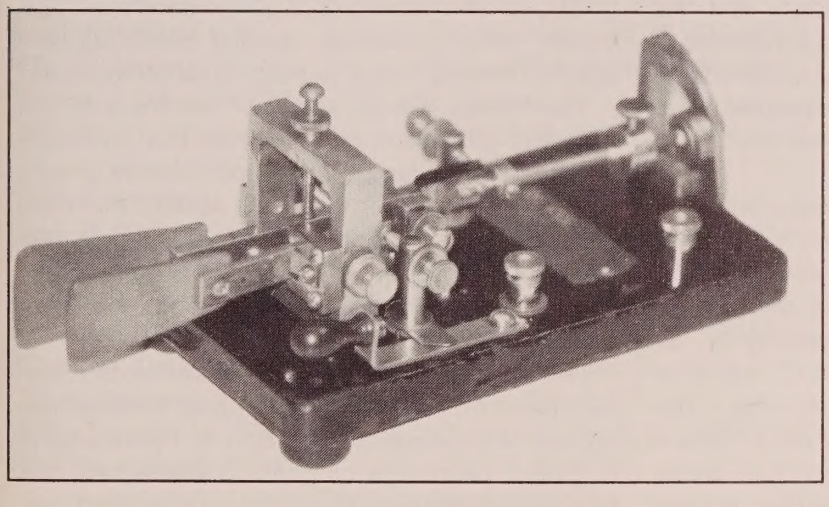
EDITED BY
LOU MOREAU
W3WRE

As reported under "AWA News," Lou Moreau has retired from editorship of "Key and Telegraph" after ten-plus years' service. We all thank her for her contributions to our knowledge of this topic. Looking forward, well known telegraph historian-collector Roger Reinke has kindly agreed to contribute this column in future issues. - Ed.

MORE DOUBLE-LEVER MYSTERY

Chuck Brydges, W4WXZ
9501 Shallowford Rd., Lewisville, NC 27023

In late March 1992 I conferred with Bill Holly, K1BH, about a double-lever bug I obtained which had an Albright license thereon. Holly remarked that this was the first case he had ever heard of that confirmed that a double-lever "bootleg" bug actually existed. Photographs were forwarded and a later conference with Holly confirmed the great similarity between the Vibroplex double-lever and my unit, as you can see by checking references A and B against the top photo. The bottom left picture shows the Albright license tag.



The one major difference is the form of the circuit-closer, or shorting lever. On my unit the curved piece, held by three small bolts into a block up against the fulcrum or arbor, is broken where it rests against the dash lever. Otherwise this unit looks like a Vibroplex. It has red fiber paddles and red fiber insulators on or through the base.

Where the mystery comes in is shown in the bottom right photo. Engraved on the left outer surface of the damper is "A. N. MC NEW." Even though it is very faint, I do believe there is a period after the "W" in MC NEW, which would mean the last name is indeed abbreviated due to lack of space.

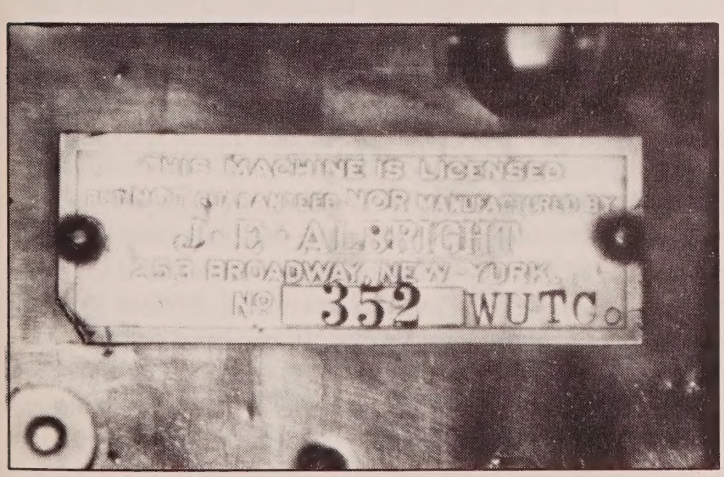
Is this the last name of the Western Union operator who used the bug under the Albright license? Or, could it be the name of the maker of this bootleg bug? If anyone reading this article has any opinions regarding this engraved ID, please send me your comments.

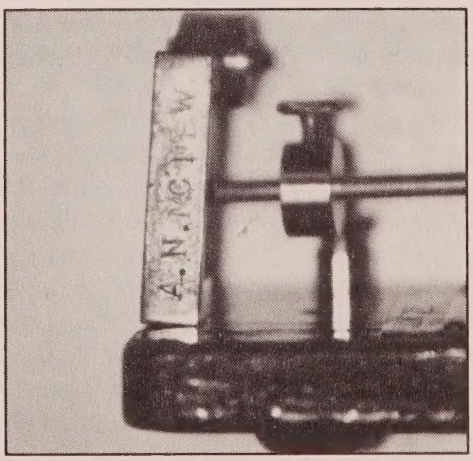
I take this opportunity to thank AWA members Bill Holly, for his assistance; and Lew Elias, W4DBT, and Robert Lozier of Monroe, NC, for helping me obtain this unusual piece for my telegraph collection.

REFERENCES

A. Bill Holly, K1BH, The Vibroplex Co. Inc. - 1890 to 1990 (Portland ME: The Vibroplex Co., Inc., 1990), p. 11.

B. Bill Holly, K1BH, "The Missing Link," *OTB*, Vol. 32 No. 4 (Feb. 1992), p. 41.





THE MAILBAG

Readers' comments on early radio topics are welcome. Because of space limitations, letters that are published may have to be edited. Send all material to the Editor.

TRANSISTOR SETS

This letter is in reference to "Transistor Radios - Mature at Last," the ADVERTISEMENT in the most recent issue.

After reading this, I ask myself WHAT IS GOING ON? I, for one, am surprised and shocked to find such an article in the *OTB*, the publication that is seen and kept around the world. Has our hobby gotten to this? Someone talking about filling one's wallet? Hopefully not everyone has the same opinion as the author.

The reference to "Boys' Club" I find also in poor taste -- after all, were we not all BOYS before we grew into "OLD TIMERS"? I do not feel that I am overacting to this situation, but do feel that my comments are of some merit.

This article was truly a clever way for a Dealer to create a shock amongst collectors with a COPYRIGHTED story that appeared at the Association's expense. The content was of little historical significance and, to top things off, contained an invitation from the author to conduct business by phone.

All I can say is that hopefully this will not happen again and that someone did not notice that this could have happened. NO, I am not a collector of transistors, but let this be a lesson to all. It will no longer be fun nor will history be preserved if we don't start thinking and let things run wild. **William M. Wade, Jr., KA3TVX**

This article appeared because it represents fresh ideas, wittily presented, on a topic where the usual writing is pretty bland. It also gives some rock-solid restoration advice, for example, about not inadvertently mongrelizing a classic set in "restoring" it. As for value: one look at the ads in "A. R. C." will show that there are new economic winds blowing. The story suggests that we not undervalue sets for which there is a strong demand, both within "our" hobby and outside. Getting out the idea that there is some dollar value in certain transistor sets will help keep them out of landfills. (How many of all the Catalins ever made survive today?)

Mr. Cohen's article should stimulate some thinking, and some lively writing in the OTB, on transistor collecting. What are the real trends? What is truly valuable, not merely fashionable? What is the place of "novelty" sets? Should we shun "modern" sets with printed wiring, focusing on the hand-wired ones with plug-in transistors? What role do the (scarce) transistor-tube hybrids - the Automatic Radio TT600, for example - play? Writers, to your keyboards!

As for the copyright: occasionally a writer asks for copyright protection, and we respect that wish. The thoughtfully edited MAARC newsletter does the same. Practices vary: every word is copyrighted in "Antique Radio Classified," the ARCA "Gazette," "Radio Age," the BVWS "Vintage Wireless," . . . and the AWA Review. -Ed.

ANOTHER VIEW

Congratulations on the #3 issue - it is the best in years. **Bob Hager, K3HOX**

RESTORING COILS

Mr. Owens' method of restoring audio transformers ("The Chemistry of Coils'" Vol. 33 No. 4) beats trying to "zap" the unit with high voltage. However, I am writing because some of your readers could face a problem with this method. The problem was mentioned in *Vintage Wireless* of the British Vintage Wireless Association ("Repairing Transformers and Coils," Vol. 15 No. 1).

That article concerned RF coils, but the same thing applies to any coil with fine copper wire - audio transformers, earphones, loudspeakers. The problem: copper is soluble in a molten alloy of tin and lead, that is, ordinary solder. Very fine wire can simply disappear into the solder during soldering, or as a minimum can become eroded and brittle. This, incidentally, is what causes copper-tipped soldering "irons" to become pitted with use.

The *Vintage Wireless* solution: use Ersin Multicore "Sav-Bit" solder, an alloy of tin, lead, and copper made in England. The copper content is very small, but is sufficient to kill the solder's thirst for more copper. As the name suggests, it will also make your copper bits last longer. I hope the companies that supply equipment to radio collectors will stock it.

Two suggestions of mine: first, don't solder, but use conductive epoxy. This material contains silver and so is expensive, but worth it. I have used it to replace phone tips on phone cords. I have not tried it for repairing transformers, but don't see why it should not work. It is listed in some electronics catalogs, and, again, I hope radio-collector suppliers will stock it. The resistance is, of course, higher than that of solder, but this is unimportant in this application.

The other suggestion: if you are going to use tin-lead solder, use the eutectic version: 63% tin, 37% lead. This should reduce the problem, since you can solder at a lower temperature. **F. Cecil Grace**

The gradual solubility of copper (and silver or gold plating) in solder is well known - the tips on soldering guns, in particular, seem to be pure copper, not the iron-plated stuff used in a many electronics-type soldering irons, and therefore give a miserably short life.

(Continued on p. 54)

NEW MEMBERS

Joyce Peckham

AWA welcomes the following new members. We list all new members routinely - if your name does not appear within six months after joining, please advise the Editor. If you do not wish to be shown, just mark the application form accordingly. AWA does not provide an address list or other directory of its membership.

Ron **Agnello**, NY
Richard **Ahlvin**, MS
Peter **Amato**, NY
John **Anthony**, N2CBI, NY, BBC
Michael N. **Bald**, OK
Bruce **Barnum**, IN
Frank **Baugh**, ON
J. Stephen **Beale**, TN
David J. **Bertman**, AB7B, OR
John R. **Blasingame**, W2CHE, NY
Warren **Boxleitner**, MA
Martha & Donald **Brenek**, VT
Martin Anthony **Brooks**, ON
R. E. **Brown**, ON
Rich **Brown**, CT
Lee **Bruton**, CO
Eddie **Burris**, MN
Daniel J. **Carella**, W2ENV, NJ, GE, RCA, Fed. Tel. Labs
Cliff **Carey**, MI, WAIR-WTRV
Robert **Champeix**, France
David W. **Chase**, MN
Robin **Chesnutt**, WA5YGR, OK
Andrew **Chung**, ON
Doug **Clanton**, GA
James O. **Coleman**, CA
William C. **Coleman**, TN, Tennessee School of Broadcasting
John **Connelly**, IL
Jack D. **Cothran**, VA, RF&P Railroad, Amtrak
Wayne R. **Cripe**, W2RQD, NY
Walter R. **Davis**, MO
Claude J. **Dellevar**, Jr., CA
Tom **Dickinson**, VA
Mike **Dinolfo**, N4MWP, VA
Neil **Dorfman**, K8IGW, MI
Bill **Duggan**, NY, USN 1979-88, LF-HF-VHF-UHF-crypto
Horace **Durfee**, CT
Horace **Durffee**, RI
Frank **Eder**, NY
Cliff **Ellement**, VE3CFE, ON
Robert **Fanetti**, NY
Tony **Flanagan**, NJ, NJ Antique Radio Club
John K. **Folsom**, Jr., FL
Mark **Foltarz**, OH
Robert **Forsberg**, MA, Harvard Coll. of Hist. Scientific Instruments
E. Victor **Fortinberry**, AL
C. E. **Fox**, KC4YMC, VA
Roger **Frith**, N4IBF, TN, Curator, Tennessee State Museum
Franco **Garavoglia**, MI
Gerard **Faassen**, Holland
Jim **Gettelman**, WI
Andy N. **Gilberg**, GA
Wayne **Gilbert**, CO
Kenneth G. **Givens**, KE3CT, DE
John **Goddard**, ON
Jonah L. **Goldstein**, NY
Victor **Gomez** Mengod, Spain
Stephen J. **Goscinsky**, N3HWD, PA
Robert **Griffin**, CT
James L. **Gullett**, MI
Dave **Harris**, NY
Al **Harrison**, NY
Donald **Hastert**, MN
Cliff **Hensley**, WB4NKL, TN, radio tech, CSX Railroad
Jerry **Hirsch**, WA2ZFA, NY, Hirsch Sales Co.
David H. **Hitt**, TX
Joe **Holstein**, N8EA, MI
Heinz **Horbaschek**, Germany, Siemens
Barry J. H. **Houston**, New Zealand
Tim W. **Hunter**, PA
Edward D. **Huntley**, KA2KFC, NY
Kent A. **Ise**, RI
William G. **Jackson**, Jr., GA
Bill **Johnson**, GA
Bonoe **Johnson**, FL
Jeffery **Kabat**, MI
Charles N. **Kaeff**, Sr., N4FFP, KY
Gene S. **Katz**, NJ
Peter **Kelly**, CA
Richard **Kennedy**, NY
Walter **Kiefner**, WA
Russell **Kleinman**, OH
Stanley J. **Kosin**, PA
Mark A. **Kovalan**, IA
Dick **Kowalski**, MI
John M. **Kozlowski**, N2SDH, NY
Virgil F. **Kramer**, K4IDB, OH
Harold F. **Kravcik**, IL
Walt **Kunz**, NY
Matt **Kurzdorfer**, NY
Lawrence E. **Larsen**, MD, Medical Microwave Research Corp.
Jack R. **Lash**, DE
Michael **Leeds**, CA
Richard **Leizure**, CT
Sal A. **Lentine**, NJ
Muriel Isabella **Lock**, England
Robert F. **Lockhart**, Jr., VA
Pasquale **Lombardi**, NJ
Mark **Lucas**, PA
Alan **MacDonald**, NJ, military
Paul **March**, ex-KR6LOT, MN
Earl & Isabelle **Marshall**, ex-8PJH, CA, radio trmsn eng., Bell Tel. Co. of PA, Pacific T&T
Robert A. **Martin**, MA
Bruce W. **McCalley**, PA, radio-TV tech, wholesale electronics
Frank **McGann**, NY
John **McGill**, AL
Terry L. **McGinnis**, NC
Lawrence **McKane**, NY
Donald S. **Merz**, PA
Craig **McLean**, VE2FYD, ON
Bob **McTeague**, MA, WMFD
Arthur F. **Miller**, MI
Leonard R. **Miller**, K8GM, MI
Richard G. **Moberly**, W6NNQ, CA, USAF, EE, USN Radio
Donald A. **Morin**, NY
Philip H. **Morse**, W2WAX, NJ
Charles **Mrazovich**, FL
Gilbert S. **Murray**, FL
David J. **Napoli**, NY
Robert & Jeanne **Nicholson**, NJ
Vaughn **Nixon**, MA, GE
Hugh **O'Donnell**, W3FUO, MD
Henry D. **Olson**, W6GXN, CA, SRI International, Site 514
Randy **Orbaker**, NY, WRMM, WNYR, WEZO
William **Overbeck**, PA
Mike **Palozzi**, ON
James **Patrick**, NY
Vince **Pawlacyk**, WI
Craig L. **Pitcher**, IL
Edwin S. **Pittaway**, OR
Thomas **Ponzo**, NY
Evan J. **Powell**, CA
John **Pristash**, WR8G, OH
Gord **Rabjohn**, VE31LZ, ON
T. V. **Ramsey**, VA
Norbert **Rawe**, OH, WEKY
David **Reese**, W3WKP, VA
Lee M. **Richey**, WA3FIY, PA

Stan **Riome**, VE3STN, ON
Eugene **Rippen**, CA
Stephen T. **Robbins**, KC4UQA, NC
Tony **Rogozinski**, N7BG, AZ, microwave & HF transmitter tech
Joe **Roberts**, N4WQC, VA, Sound Practices Co.
Kenneth **Rosen**, NJ
Curt **Ross**, NY
Edmund **Ruane**, FL, repairs antique electronic & mech. eqpt.
Larry **Rybacki**, WA2ARA, NY, U. S. Border Patrol
John **Sakat**, NJ
Tim **Salata**, NY, WHAM, WHFM, WROC, WRMM
Howard H. **Sander**, NM
Al **Savio**, N2OBH, NJ, consultant
Larry **Scheer**, AR
Robert **Scheps**, NY
Al **Schopman**, VE7ICC, BC, Microtel, Lenkurt Electric
John J. **Schlitt**, MI
Larry **Scofield**, AZ
Mark J. **Shumate**, GA
Alan L. **Skerker**, KC4ZA, VA
James D. **Skladany**, CA
Thomas B. **Smith**, N5AMA, TX
Arnold A. **Sorensen**, NY
Colin **Spence**, NY, WNBC-TV
Nicki J. **Spencer**, IN
Jerry **Spets**, ID
Michael **Spotts**, SC
Ted **Staff**, CA
Larry **Stencel**, MI
Kim **Stephenson**, ON
James F. **Stitzinger**, CA
Robert **Stohlman**, WB5QVN, VA
William **Stokes**, NJ, US Navy
Scott **Stowers**, GA
Fred **Swearingen**, FL
Peter J. **Tefft**, CT
James E. **Terrell**, TN
H. D. **Thompson**, BC
Warren I. **Tiffany**, WA
Henry **Tillema**, NY
Frank **Toce**, NY, WTKW
Edward J. **Vendeville**, AZ
Evan J. van **Eenwyk**, FL
Marilyn **Verzolini**, NY
Leonard E. **Walk**, FL, ex-owner of group of radio stations
Stan **Walker**, ON
Frederick W. **Watson**, VA
Tom **Watson**, ON
Leo **Weislo**, NY
John C. **Wells**, NY
David W. **Whiting**, ex-VE2BTW, ON, Transport Canada
Edward F. **Wille**, W9PWG, WI, Sound & Video Service Inc.
John Milton **Williams**, CT
Loren **Williams**, KY
Michael **Wimer**, VA
Dieter **Wolbart**, NJ
Fred **Wood**, PA
Harold **Yackel**, NY
Jeffrey **Zepp**, NJ

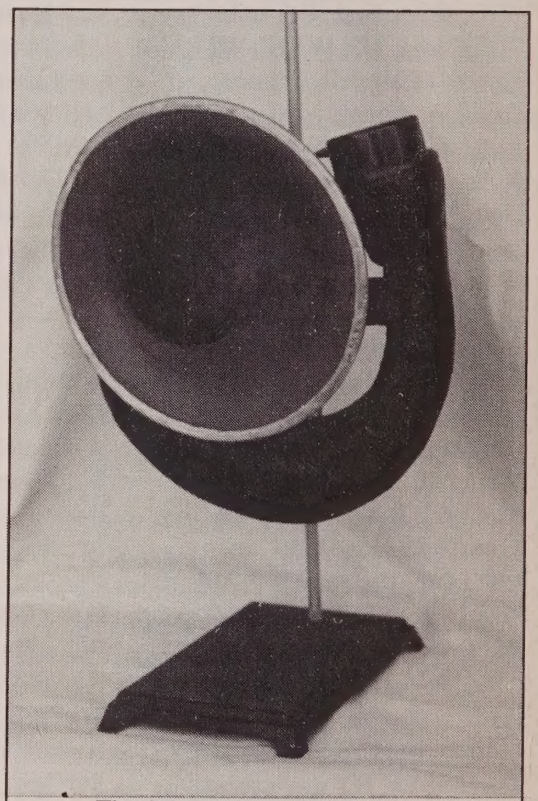
(Continued from p. 20)

1921. In this issue, plugs, transformers, detector and two-step audio stages, sockets, meters, horns, Brown (English) earphones, and other parts were advertised. In May of 1921 the laboratory model was priced at $23 and the mahogany cabinet at $25. The author's replica laboratory-model stand has a rectangular metal base, whereas advertisements in 1921 showed a round base. A red seal ("Dodge Tone Amplifier - Patent Pending") was attached to the rear of the neck and bell. A replica seal is shown.

Repro seal for the horn.

The Firth company was evidently bankrupt by May 1923, since on May 26 the *New York Globe* carried ads from various dealers offering Firth equipment at one-third of original price. But Col. Firth himself advertised parts, phones, and horns sporadically for another three years before retiring completely.

Acknowledgement: Larry Wright of Lake in the Hills, Illinois, supplied Firth information as well as the replica seal for the Firth horn.


The laboratory-model Firco.

(Continued from p. 52)

But we should be OK in soldering coil leads: the heat is applied for only 2-3 seconds. Copper dissolves far faster at molten-solder temperature (ca. 400 °F) than at room temperature. After all, the solder joint at the uncorroded end of our repaired coil is still good after 60 years or so.

Ersin Sav-Bit solder is still with us - Newark Electronics Catalog 110 lists it, with the notation "reduces solution of fine wires and thin films." It and the latest Edlie Electronics catalog offer eutectic solders.

Silver-loaded epoxy has useful possibilities, for example, in cases where it's just too difficult to get to the joint to solder it.

RECENT RADIO AND ENTERTAINER OBITUARIES

Charles Griffen, W1GYR
1225 New Britain Ave., West Hartford, CT 06110

Charles P. Ginsburg, 71, retired VP of Advanced Technology and Planning at Ampex. He headed the development team that produced the original commercial videotape recorder.

Robert Hertzberg, 87, W2DJJ, ex-2ABK, electronics editor and active writer of magazine articles and amateur-radio and electronics books. Well known for his book So You Want to Be a Ham, he had been editor of *Mechanics Illustrated*, then founder of *Electronics Illustrated*.

Ernest B. Lewis, 77, engineer, who helped establish the manufacture of quartz crystals for transmitters, medical ultrasound work, nondestructive testing, and related uses. He was Chief Enginer at Crystal Research Laboratories in Hartford, CT; then in 1948 founded the E. B. Lewis Company in East Hartford.

Sol Paul, 72, 1941-53 reporter and advertising manager for *Broadcasting*. He left to start *Television Age*. Radio was added in 1970. In 1981 his cable magazine was merged into the publication, which ended in 1989.

IN-HOUSE

Bruce Kelley

License Restriction: According to *Radio Bygones*, rather unusual restrictions applied to early British amateurs. A license issued in 1913 to a J. J. Shaw allowed him to communication with five other amateurs whose names were noted on the license.

The Winner! There was much interest and pleasure for members attending the Conference's Thursday evening entertainment program: 120 old-time movie playbills flashed on the screen while 60 musical numbers of the '20s and '30s were played. A challenge: who could name titles for the greatest number of tunes? Reggie Collins, KE2HE, came in first, closely followed by Merrill Bancroft. I asked Merrill how he knew so many of the old-time tunes. I believe he said he had 10,000 player-piano rolls!

Congrats to W2GB: 80 years of amateur radio! After reading of the Titanic disaster and the sending of CQD-SOS, George Batterson and his brother made a transmitter and receiver and were on the air in the fall of 1912. AWA founder W2GB can be heard regularly on 40-meter CW.

Signals from Mars: Efforts are now being made to locate a lost 35-foot length of radiophoto film which recorded mysterious "dots and dashes" received in 1924 when Mars was close to Earth. The signals (?) aroused much speculation that Martians were signalling Earth (*N. Y. Times*, Aug. 28, 1924). C. Francis Jenkins, television pioneer who invented the recording device, was skeptical. What happened to the film?

WQXR (1560 kHz) is changing call letters to WQEW and redirecting its programming after 50 years of classical music. Little is lost, however, since the new format will be "big band" and the companion FM station WQRR will continue with classics, no longer simulcasting. WQXR (then-W2XR) was founded in the '30s by pioneer John V. L. Hogan who experimented with facsimile and high-fidelity broadcasting. His early transmitter is in the AWA Museum. The station was purchased and is still owned by the *New York Times*.

1929 Transmitter: I first went on the air as a teenager in the fall of 1929 using a UX-201A in a Hartley oscillator. Most transmitters of the period were low-power self-excited oscillators and had a faint chirp and a trace of hum from a two-mike filter. Wanting to relive those early days, I suggested the 1929 QSO Party, hoping to hear again old-time CW signals. What's happened? With few exceptions, most signals in the recent QSO Party were 599, no chirp and no hum. Maybe my memory of the old days is kinda hazy . . . or is it?

Scanning the Past: a series of one-page biographies by AWA member Dr. James Brittain in the *Proceedings of the IEEE*. Jim researches each subject and somehow keeps his material to one page. Subject material is brief bios of well known electronic or radio engineers and their contributions to industry. Examples: Ralph Hartley, J. V. L. Hogan, William Hewlett.

Fessenden Memorial Station can be heard regularly from Fessenden's birthplace at Knowlton, Quebec. Using call letters VE2FRV ("Fessenden's Radio Voice"), the station can be heard on most amateur bands. I worked it recently along with Fred Hammond, VE3HC. Fessenden held innumerable patents, pioneered in voice transmission and developed the heterodyne principle.

HISTORICAL ARTIFACTS

Old-time ads are free to members collecting and restoring equipment for personal use. **The rules:** (1) one ad per issue per member; (2) include an SASE if acknowledgement is desired; (3) material must be over 25 years old and related to electronic communication; (4) give your full name, address, and ZIP code; (5) repeats require another notice - we aren't set up to repeat automatically; (6) the Association is not responsible for **any** transaction; (7) we retain the right to reduce the size of the ad if over seven lines; (8) AWA does not accept commercial advertising; (9) deadline for ads in the May issue is March 9; those received later will be held for the following issue. Mail **all** ads to: **Richard Ransley, Box 41, Sodus, NY 14551.**

SELL/TRADE - BC/SW RADIOS

Silvertone model 656 wood table battery radio. Needs dial glass and knob. $12.50 plus 10 lbs. UPS. John Uscinowski, RR #1, Box 379, Greenwich, NY 12834-9519.

Trade Telefunken crystal set Type 1 and Martian Special xtal set for interesting US-made xtal sets. Pse make offer, if possible w/photo. Erwin Mačho, Ambrosweg 17/A/8, A1230 Vienna, Austria.

Radiola 20, Magnavox J, Crosley XJ, Grebe MU-1, Philco 60, Scott Allwave 12, Sky Buddy, Easy 101 FM station promotion radio, Regency MR-33, GE 140. Speakers: Ship, WE 540, Farrand, Pausin and large gold frame Metro Electric Co. Richard Botzum, RD 2, Box 419, Morgantown, PA 19543, (215) 286-0047.

Old furniture-style radio - Mantola-?, possibly 1940s with AM/SW in working cond.. Asking $400. All original except line cord. Mathias Steckl, 8 Abbot Court, Flemington, NJ 08822.

Knobs: Custom-molded plastic knobs. Send knob to be copied plus $8 ea. for plastic, $12 ea. for imitation wood or Catalin. Custom-formed plastic dial lenses. Send old lens if possible, tracing of lens opening plus $15 each. L. W. Terrell, 7109 E. Arbor Ave., Mesa, AZ 85208, (602) 830-7849.

Crosley "Oracle", grandfather clock, 1931, Model 59, exc. original, needs two tubes and is untested. $400 + shipping. John Dudley, Rt. 1, Box 576, Hood, VA 22723, (703) 948-6290 evenings.

Philco 40-105 tall farm radio w/elaborate front openings, Crosley 166 "Travo," M. J. Carls "The Golden Bear" 4-foot folded horn, Zenith M-660 5-band comm rcvr, Philmore Jr. mic., NIB, all plus UPS. Chuck Bray, 1322 Ivy Rd., Bremerton, WA 98310, (206) 373-1013.

Cathedrals - AK 165 in VG orig. cond., plays, $425; AK 206 in good cond., $400; battery sets - Michigan one-tube, good cond., $275; Radiola 20, good cond., $175; Radiola 20 cabinet $75. Globe-shaped 01As, test good, $7 each; Kellogg 401As, (2) new in box, $60 for pair. Charlie McCarthy, professionally restored $1250; RCA chair (dog & phono on back), VG cond., $250. Don Houde, 1000 Ashland Ave., Apt. 2., St. Paul Park, MN 55071, (612) 459-9135.

RCA 100A, $75; 12" speaker w/950-Ω field, $25; RCA "B" eliminator AP-937, $75; Simpson I-177B WW II tube tester, $75; Bogen Mod. 60 amp. $50; Bosch Mod. 58A, $75. Majestic: Mod. 72 cabinet, $75; Mod. 75, $75; 90-B chassis, $50. Philco Mod.s 38-4, 39-40 and 112, $75 each. All working, plus shipping. Robert Rossi, 10936 Melbourne, Allen Park, MI 48101.

Zenith Super Transoceanic portable H-500, chassis 5H40; Hallicrafters portable TW-2000. Both in good cond. and working. Lester D. Smith, 216 N. Georgia Ave., Caldwell, ID 83605.

Eveready radio, uses 1 "A" and 1 "B" battery, $15. Michael Morrell, Rt 2, Box 5024, Williston, IL 32696.

Stewart-Warner 303 5-tube TRF, VG cond., $140 or B.O.; American Bosch 370, $110; 28 $135; Amborola 16, $270. All in working cond. except Amborola needs switch. Echophone EC-1A, EC-1B and EC-3; National NC-33, NC-57, NC-173, NC-125 and SW-54. Harry Kundrat, W2YEZ, 29 Walton Ave., New Providence, NJ 07974, (908) 665-1873.

Trade Aeriola Sr., Pilot 3" TV. Looking for Grebe CR-series 1-4, 8, 12, 14. Bill Hurni, W3HWT, 329 Evergreen, North Wales, PA 19454, (215) 699-5787.

SELL/TRADE - COMM GEAR

Sell/trade Stancor ST-202A transmitter and Globe (WRL) 755 VFO. Want Harvey-Wells pwr. supply and VFO. A. Bruno, 24 Butternut Dr., New City, NY 10956, (914) 354-8899.

New National HRO-500 receiver in factory-sealed box, 5 kHz to 30 MHz AM-SSB-CW, $1100. Hank Brown, PO Box 3514, Lancaster, CA 93586, (805) 943-2027 8 AM - noon.

Hammarlund HQ-100A $100; Hallicrafters S-38B $45; nice Radiola Sr. $180. Want Neutrowound radios, speakers, literature. Jeffrey Viola, 475-B Eltone Rd., Jackson, NJ 08527, (908) 928-0666.

Collins: restoration of 75A series, 32V series, and other Collins eqpt made easier with drum, round-faced dial, and meter overlays and transparencies. By a hobbyist for the collector. David Knepper, Box 34, Sidman, PA 15955, (814) 487-7468.

SELL/TRADE - GENERAL

Oldsmobile "Six-Tube Standard Radio," untested; mint Audels New Electric Library, Vols. 1-3; International Correspondence Schools 1925 course, 20+ lessons on autos and electricity; lollipop mic, light brown bakelite; Allied Radio American Bell headphones. Want Sparton 79A speaker, tuning knob, data. Don Mertz, 47 Hazel Drive, Pittsburgh, PA 15228, (412) 234-8819 (days) or (412) 344-0956.

Westinghouse Aeriola Sr. (Type RF) w/type 30 tube; Phillips 2802 w/coil box and all 6 coils, 2400 m to 10 m; Sprague Model 500 interference locator, 0.55-220 MHz (used 3 2-V wet cells); new WW II boxed Western Electric 1N21s & 1N23s, in orig. lead sheaths. Hank Olson, W6GXN, 1751 Croner Ave., Menlo Park, CA 94025, (415) 326-8149.

SELL/TRADE - LITERATURE

Stock Certificates - Baird Television Ltd. (1936). John Baird, developer of mechanical scanning TV in 1928. Limited qty., $60 ppd. See article in *OTB* Nov. 1992. J. J. Papovich, 53 Magnolia Ave., Pitman, NJ 08071, (609) 582-8279.

Nikola Tesla, 1st Ed., 1904 Experiments with Alternate Currents of High Potential & High Frequency with biography and photo of the author. Includes appendix "The Transmission of Electric Energy Without Wires," ex-lib, in VG+ cond., $225. Lawrence Larsen, 308 Hamilton Ave., Silver Spring, MD 20901, (301) 587-8143.

Old radio books. Technical, ham, bio, Radio Boys fiction, etc. List free for a SASE. Bill Littlewood, W9HE, PO Box 681, Brookfield, WI 53008.

Old-time radio shows on tape cassettes. Catalog listing nearly 5000 shows arranged by category and title, $2. Herbert Parsons, Jr., PO Box 2284, Peabody, MA 01960.

Most-Often-Needed 1939 Radio Diagrams, 192 pp., Supreme Pubs., $13 ppd; manual for radio rcvrs BC-312M & -N, with diagrams & parts list, 44 pages, $13 ppd; manual for Collins aircraft xmte ART-13, 354 pp. plus other pertinent info, $25 ppd. J. P. Flanigan, RR 2, Box 4558, Elverson, PA 19520-9802.

Lavishly illustrated and a delight to read, The Portable Radio in American Life is now in paperback. $24.95 (plus $2 in U. S. and Canada, $10 elsewhere, for shipping). Michael Brian Schiffer, 2718 E. 10th St., Tucson, AZ 85716, (602) 325-3532.

Book QTC (I Have a Message for You): Sorry, hardcovers all sold, but paperback still available. Write Sequoia/KA5HCX, 2502 Cockburn Dr., Austin TX 78745, (512) 442-1311.

Anyone interested in having the "Olde Tyme Radio Services Directory" available in electronic form for the IBM PC family of computers, or a non-fancy printout? If there's a demand I will update and completely overhaul the directory for 1993, so if you offer a service which doesn't appear regularly in any publication, let me know. Andrew Mooradian, 5 Priscilla Lane, Winchester, MA 01890.

Radiola III/IIIA fans! Long SASE brings free list of available literature: multi-page analytical "treatise"; emergency use as crystal set; factory-authorized updates and modifications; professional, enlarged diagram with itemized parts list giving all values; details on WD-11 substitute units ($11 each, ppd.). Lots more! Dave Smith, K9UIM, Box 81, Olney, IL 62450, (618) 392-6601.

Mr. Gridley's "1937" (1993) cartoon calendar from ARCA. Order direct from the artist. $9.95 ppd, VRS PO Box 541 (OT), Goffstown, NH 03045, (603) 497-2988, Compuserve #72440.1356.

First user-friendly circuit for early BC-348s, reads left-to-right on two 8 X 14 sheets with most component values, $2 with two 29-cent stamps. Ray Larson, 12241-½ Gorham, W. Los Angeles,CA 90049-5214.

SELL/TRADE - MILITARY

ARC-5 rcvrs & transmitters, many mint cond., all new with orig. tubes. Send SASE. Ralph Zekelman, 6485 Gross Road, Bloomington, IN 47401.

SELL/TRADE - TEST GEAR

Microwave freq meter/sig gen 375-1725 MHz, Lavoie Labs 105-SM, less batts. $40; Rider's manuals 10, 11, 12, $15 each. All plus UPS. Have 500 assorted panel meters. Send wants. Frank Krantz, 100 Osage Ave., Somerdale, NJ 08083.

Sencore field-effect multimeter FE-20 hi-lo w/o lid cover, but in mint cond. with manual, $35; Knight flyback checkers, no manual $10; Telematic 8" Telecheck - all sockets, leads and instructions w/beautiful case $25; Hickok 539-B tube tester, meter bad, but checker in VG cond., w/manual. All plus UPS. Ken Miller, 10027 Calvin St., Pittsburgh, PA 12535.

Mint-cond. Heathkit IM-2215 digital multimeter with manual, $25 postpaid. Ken Greenberg, 4858 Lee, Skokie, IL 60077, (708) 679-8641.

SELL/TRADE - TUBES

Tube sale! 100 for $30. Mostly pulls, some new, all indiv. boxed and checked. List of other tubes, $1 plus SASE. Need schematics for NC-125 and Supreme 530 oscilloscope. Bill Williams, PO Box 63, Regina, KY 41559, (606) 754-5863.

For sale: (5) CRC 808 and (7) CHS 807. Write or call for more info. Don Patton, KD4FZK, 400 Pinewood Ct., Fern Park, FL 32730-2228, (407) 339-1369.

Tubes - Australian-made copies of early WE 101D and 104D. Made by Standard Telephones and Cables - SY4101D and SY4104D, new in boxes. US $25 plus US $10 shipping. Ron Langhans, 82 Bass Dr., Baulkham Hills, NSW 2153 Australia, phone 61-2-674 2846.

Radio/TV tubes, new and used, all tested, $1 each (no two-digit types). J. Cadrecha, 292 S. Prospect St., Burlington, VT 05401.

New in boxes: 872A, VT-129/304TL, VT-46A, 866A, 24G, VT-136. Al Jenkins, 922 N. Country Plaza W., Gilbert, AZ 85234, (602) 892-5183.

WANTED - BC/SW RADIOS

1937 Sparton knobs and tuning-eye cover, fits console 867 and others; Rider's Vols. 18-23; Stromberg-Carlson speaker #P27385; one- to three-tube battery sets and xtal sets. Jim Berg, 4261 Wilcox Rd. Box A, Northport, WA 99157, (509) 732-6155.

Speaker for AK 206. Any cond. will do; will buy chassis and speaker if necessary. Henry Cohen, 2459 8th St., Fort Lee, NJ 07024, (201) 585-0030.

AK 246 cabinet, AK 708 chassis, Philco 51 chassis, Crosley 52 and 51A panels, Western Electric receivers and amps. Marc Ingenthron, 9748 Outlook, Overland Park, KS 66207.

Restorable Zenith wood table radios 6S27, 5S29, 6S137, 6S128, 8S129 and 10S130 in any cond. Basket cases OK. James S. Fisher, 344 Harrison Ave., Manville, NJ 08835, (908) 725-7476.

GE Model A-82 tombstone, cabinet only or complete radio. S. Farnham, 11528 San Jose Blvd., Jacksonville, FL 32223.

Zenith 6-volt DC radio Model 6B107 and remote speaker; Rider's Vol. 20 and 23. George Bonanno, 34 Charles St., Clifton, NJ 07013, (201) 746-5953.

Crosley Trirdyne Super Regular or Super Special in good or restorable cond. Knox Lee, 630 Shadowbrook Dr., Columbia, SC 29210, (803) 772-6593.

Zenith chassis 6A40 in working order for Transoceanic Model B-600. Cabinet not needed. Roland Martick, 2 Goose Hole Lane, New London, NH 03257, (603) 763-9172.

Wideband RF xfmrs: Acme R-3 (need 2), Acme R-2 (need 1). George Freeman, 102 E. Main St., Madison, IN 47250 (812) 265-6878.

Zenith 65362 or 95365 pushbutton assemblies; Airline 62-10L chassis; dial for Radiola 16; speaker for Philco 70/90. Keith Park, 795 Grooms Rd., Rexford, NY 12148, (518) 373-0417.

Fada 460A. State cond. and price (incl. shipping). $50 finder's fee offered. Gerson Eisenberg, Belvedere Towers, Apt.108, 1190 W. Northern Parkway, Baltimore, MD 21210, (410) 435-8351.

Any or all of the following Federal 61 parts: Good front panel, No. 66 audio, No. 31 coil. Charles Pierce, 4380 E. Brookhaven Dr., Atlanta, GA 30319, (404) 233-1340 after 6 PM.

1937 RCA 87T table radio in exc. cond.. Jim Coleman, PO Box 2348, Pasadena, CA 91102, (818) 584-4263.

Majestic 310A mixer coil and schematic; Silvertone 4464 tombstone speaker and schematic; Philco 89 six-tube cathedral chassis less tubes, but with good coils and xfmr. Rick Lindquist, KX4V, Rte 2, Box 530, Radford, VA 24141, (703) 639-5098.

Westinghouse RA-DA rcvr in any cond. w/o tubes or only the DA part; Grebe Synchrophase, Radiola AR-812 or Radiola Regenoflex in good orig. cond. Will pay fair prices and cover all freight costs. Patric Paris, DF3VG, Metzinger Str. 8, 7433 Dettingen/Erms, Germany, tel. 01149-7123-8552 (1900-2100 GMT), fax 01149-7121-36670.

Frequency-dial scale, lamp socket, tuning knob (without arrow), and square tube shield for a Philco 37-60 code 121 or will buy junk set with above parts. Timothy Yang, 5 Rebecca Dr., Apalachin, NY 13732, (607) 625-5288.

Any Thomas E. Clark or TECLA (of Detroit, MI) wireless eqpt, radios or literature. Jim Clark, 1292 Starboard, Okemos, MI 48864, (517) 349-2249.

GE portable shortwave radio Model 7-2990 (GE World Monitor). Jack Freeman, 2512 Sunnycrest Dr., Reidsville, NC 27320, (919) 349-6656.

Paragon RA-10 and DA-2 amplifier. Cash, trade up or down. Ring mic stand, Collins speaker, SM-3 mic, vernier drive, Johnson Viking milliammeter. Brian Roberts, 3068 Evergreen Rd., Pittsburgh, PA 15237, (412) 931-4646.

WANTED - COMM GEAR

National Velvet PS 5897 AB; HRO speaker and cabinet for HRO Sr. 1935-38 vintage. William McCollum, PO Box 37111, Phoenix, AZ 85069.

Needed for restoration of my 1942 Hammarlund Super Pro (military equiv.: BC-779): Table-top cabinet. The receiver width is 19," depth behind panel is 15-3/8" and height is 10-½" Thanks! S. E.

Watkins, K4OWN, 13003 Fennimore Terrace, Midlothian, VA 23113, (804) 379-0521.

Hammarlund speaker for HQ-129X communications receiver. John C. Herkimer, PO Box 54, Caledonia, NY 14423.

WANTED - GENERAL

Medical devices, violet rays, hand-crank magneto types, unusual and circa 1800s-1900s. Richard Cane, 1333 NW 127th Dr., Sunrise, FL 33323, (305) 846-7116.

Electronics Illustrated, June 1961; *Electronics World* Oct., Dec. 1961; J. W. Miller 612-W4 IF transformer; small 140-pF variable capacitors with ¼" shaft; BC "loopstick" antennas. Alvin Bernard, PO Box 690098, Orlando, FL 32819, (407) 351-5536.

Hallicrafters S-27 output transformer and S-meter. Telefunken Opus 9 schematic; Magnavox 111 amp from 1947-48 console. David Collins, 481 E. Center, Medina, NY 14103.

Variable air cap, dual, each section 365 pF, small physical size as in small tube-type broadcast table radios. Sections must be identical as to tracking. William Johnson, 1142 Hillsdale Ave., Pittsburgh, PA 15216, (412) 531-9652.

Simpson 330 tube tester charts. 1- & 2-gang 365-pF var. capacitors, Heathkit Q meter, BC-band iron-core RF coils, iron-core IF transformers, 6-pin plug-in ceramic coil forms and 5- and 6-pin sockets. Dave Dameron, 819 Boundary Place, Manhattan Beach, CA 90266, (310) 318-5311.

Ohmite 75K, 200 watt resistor as used in BC-610/HT-4. Thanks! R. Haworth, W2PUA, 112 Tilford Rd., Somerdale, NJ 08083, (609) 783-4175.

Ameco 2- & 6-meter transmitter; roll chart for Hickok 539B tube tester; Clegg "Zeus" 2-6 meter transmitter. Tad Drogoski, N3JZG, 507 Coal Valley Rd., Jefferson Boro, PA 15025.

Will the gentleman from the Midwest who had the super-mint Hammarlund HQ-129X receiver for sale at the 1992 AWA Conference please contact me. I spoke to you about the receiver and told you I just had bypass surgery. Gordon Hullin, K2ZBU, 3666 Cold Springs Rd., Baldwinsville, NY 13027, (315) 622-0141.

8021 television transmitting tubes. Also WW II airborne TV equipment such as ATK, ATJ, AXT, ATD. Allan Weiner, 14 Prospect Drive, Yonkers, NY 10705, (914) 423-6638.

Anything early Zenith or Chicago Radio Labs: Zenette, headphones and any orig. or copies of literature. Bill Wade, KA3TVX, 657 14th Ave., Prospect, PA 19076, (215) 534-3477.

Grebe CR-18. Delegate badge from 1921 ARRL convention in Chicago. Paul Christensen, 11142 Raley Creek South, Jacksonville, FL 32225, (904) 721-9111, 9 AM - 5 PM.

WANTED - INFORMATION

Want to hear from anyone who served as a radio operator on a mil or civilian airplane in the 1930-50 period, or from anyone who went to school at Port Arthur College. Ron Thomas, W8QYR, POB 347115, Atlanta, GA 30334.

Help in restoring Simpson/K & Type B 250-watt spark transmitter. Panel is 12" x 12". Does a set or photo exist? Need early cabinet for 10.5" wide by 12" high panel. Will Jensby, 645 Giannini Dr., Santa Clara, CA 95051, (408) 296-6071.

Reminiscences and anecdotes about the early days of radio and the wireless era. Also any information on National Electric Supply Co. and the CN-113. Thank you. Mike Heffner, 724 Elmira St., Williamsport, PA 17701, (717) 323-3647.

Scott Special: Contact with anyone who owns or knows about a Scott Special communications receiver. My interest is in historical documentation as I am currently expanding the Nov. 92 *OTB* article on this receiver. Your help is appreciated and all correspondence is kept confidential. John Meredith, 1644 Parkside Dir., Niceville, FL 32578, (904) 892-7734.

Information on Oracle V Radio 201As. Where and when manufactured? Howard Newton, 1008 Smith Ridge Rd., Bridgeport, NY 13030.

WANTED - KEYS

Very old telegraph-radio-electronic equipment/estates wanted. Have over 200 telegraph keys for trade. No list due to rapid turnover. Write with your specific needs. Tom Perera, K2DCY, 11 Squire Hill Road, North Caldwell, NJ 07006.

Unusual telegraph items for private collection. Oddball bugs such as vertical, midget, left-handed, or right-angle are very welcome. Also looking for spark keys and pre-1875 landline keys. G. J. Schlehman, K9WDY, 335 Indianapolis Ave., Downers Grove, IL 60515, (708) 968-2320.

Navy Speed Key CML-26009 and pre-WW II McElroy sales literature. Tom French, W1IMQ, "The McElroy Collector," 120 Great Road, Maynard, MA 01754.

Old telegraph keys and bugs; also miniature items with keys on them. Joe Bowerman, Rt. 2, Box 395, Blountsville, AL 35031.

Keys, bugs, paddles. Will trade other keys or buy. Particularly looking for old or unusual keyer paddles. John Rehak, N6HI, 4035 E. Lavender Lane, Phoenix, AZ 85044-4681, (602) 729-8019.

WANTED - LITERATURE

Dept of Commerce publications Radio Stations of the U. S. for 1913 and 1915 plus 3 supplements for 1913; Amateur Radio Stations of the U.S. for 1924; *Citizens Radio Callbook* for 1920, 21, 22; *Citizens Radio Amateur Callbook* (flying-horse cover) for 1924, 25 and 26. Bob Arrowsmith, PO Box 166, Annandale,VA 22003, (703) 560-7161 collect.

Apex Superfive receiver: schematic needed. 5-tube battery-operated - need the three voltages, the tube types or substitutes, and the speaker type. Dr. Paul Gericke, WD5IGF, 1321 Aris Ave.,

Metairie, LA 70005, (504) 831-9305.

Manuals or copies for Hallicrafters SX-17 and S-36A, National or Wells-Gardner RAO-3, Collins 75A-1. Stan Hojnacki, WA2NPL, 103 Wilson Ave., Blackwood, NJ 08012, (609) 435-8975.

Information and product literature from Lansing Mfg. Co. Lansing theater gear. Joe Roberts, N4WQC, Box 19302, Alexandria, VA 22320.

Marine Radio Manual, ed. by M. H. Strichartz, by Cornell Maritime Press, 1944. Has approx. 300 pages, 5" x 7", hardcover, with two inserts (I believe). Henry Johnson, K4IPY, 7201 Capitol View Drive, McLean, VA 22101, (703) 356-4418.

Rider's Manuals #1, 20, 21, 22 and 23. Also photos of floor cabinet for Colonial Radio Model 31AC. Steve Kalista, Sr., 9 Maple Drive, Jim Thorpe, PA 18229, (717) 325-4120.

Broadcast News (RCA) from the '30s-'50s; *Pickups* and *Oscillator* (W. E.); broadcast equipment catalogs of Collins, W. E. and RCA; orig. manual and sales brochure on W. E. 451A-1 transmitter. Sam Thompson, W6HDU, 1031 San Antonio Ave., Alameda, CA 94501, (510) 521-1429.

Manual/schematic for Precision E-400 sweep generator. Quote price, etc. H. Seesselberg, 22 Christy Dr., Warren, NJ 07059.

Schematic or service manual, also operating manual for Bendix Navigator 555 marine RDF receiver (3 bands, 140-5000 kHz, 12 transistors, made about 1960). Copies OK. Herman Plew, W6BYX, PO Box 754, Atascadero, CA 93423.

Manual or copy for Navy RBL-3, Type CWQ-46161-A receiver made by Wells Gardner; manual or copy for DFR-10 direction finding rcvr by Apelco (Applied Electronics Co., San Francisco). Jim Wilson, 35 Belgard St., Rochester, NY 14609, (716) 288-0427 (eves.), (716) 726-0952 (days).

QSTs before 1923 to complete my collection. Edward J. White, WA3BZT, 809 Seymour Rd., Bear, DE 19701-1121, (302) 322-1313.

Literature: Packard automobile radios 1929-56 - installation/operating instructions, booklets/-manuals. (Essentially all were Philco except 1940 which was Stewart-Warner). Orig.s or copies OK. Aarlo Brakel, 201 Deer Meadow, Gahanna, OH 43230, (614) 224-8606.

Want manuals/schematics for B&K 445, Eico 330, Eico 379, Sencore RC115, TS-888. Marvin Moss, W4UXJ, Box 28601l, Atlanta, GA 30358.

Radio Boys books by Allen Chapman, must have orig. dust jackets. Henry O'Meara, 42 Aqua Ra Drive, Jensen Beach, FL 34957.

Philco advertising, signs & clocks - Philco collector looking for same, in good-to-mint cond. Reasonable prices; have cash or trade items. Rick Yerke, Box 392, Moscow, PA 18444, (717) 842-4857.

Zenith printed materials from the 20s and 30s, including advertisements, pamphlets, owner manuals, signs, etc. Steve Melvin, 34 Deep Rock Harbor, Suffield, CT 06078, (203) 668-6821.

WANTED - MILITARY

Military electronic items and related equipment. WW II American or foreign sets, manuals or parts kits, dynamotors, cables, mounting racks, etc. Also need type 249C tube (mercury rectifier). Charles Di Cecca, KA1GON, 501 Mystic Valley Parkway, Medford MA 02155, (617) 396-9354.

AN/ARC-5 xmtrs: T-15, -16, -17, or -18/ARC-5. These are the **medium-freq**. Navy models - not the ham-band ones. Orig. cond. or hacked-up. Ludwell Sibley, 44 E. Main St., Flemington, NJ 08822, (908) 782-4894.

WANTED - TEST GEAR

General Radio type 874-R22A patch cords, 874-C58A/CL58A RF connectors and 874-QUJ/-QUJL connectors. Ray Beningo, AA4ZJ, 12099 Rockford Street, Spring Hill, FL 34608, (904) 686-3335.

Operator & tech manuals for Tektronix 535A and 561A oscilloscopes. Chart paper and spares for Esterline-Angus Type AW recorder and Esterline-Angus and/or Rustrak 288 recorder. Roger Moe, 8001 Lateral A Road, Wapato, WA 98951.

WANTED - TRANSISTOR SETS

Toshiba 5TR-193, 6TR-186, 6TR-92, RCA 7-BT-95, Arvin 9577, 8576, Admiral 7L, Trav-Ler TR-250, 280, 284, Bulova 250, Continental 160, Sony TR-86, TR-55, Golden Shield, Futura, Hoffman, Trans-solar. David Mednick, 1450 Palisades Ave., #5-H, Fort Lee, NJ 07024, (201) 461-3082.

Regency TR-1, working or not. Will pay your price and/or exchange for Italian sets. Also want anything to do with Marconi, such as books, magazines, postcards, pictures, ephemera, autographs, cigarette cards, etc. Enrico Tedeschi, PO Box 10, 00125, Roma, Italy, phone Rome 523 56 085.

Pocket-size radios (transistor, tube, or crystal) made in Japan or U. S., working or not. Eric Wrobbel, 20802 Exhibit Court, Woodland Hills, CA 91367, (818) 884-2282.

WANTED - TUBES

Good phototubes (photo-electric tubes) in "900" series, such as 917, 919, 922, 925, 927, 929, 930, 935. Other types such as CE-1, WL-775. Good photo-multipliers such as 931 and 931-A. Also two very good UV-199s, pref. w/sockets. Rex C. Byle, 3312 West Vera Ave., Milwaukee, WI 53209-2519.

(8) 215A tubes and 2 sockets for same. Horn speaker drivers, back issues of *OTB* before 1991. Thanks. Dan Bulic, 98 Graywood Road, Port Washington, NY 11050, fax (516) 767-1660.

Amperex AX-9903/6083 tubes and manual for WRL Globe Champion 350. Restoring 2 of these fine xmtrs. Wayne R. Cripe, W2RQD, Rte. 31, Box 224, Durhamville, NY 13054, (315) 363-1840 eves.

AND BOOK MAGAZINE REVIEWS

Edited by Bruce Kelley

75 YEARS OF WESTERN ELECTRIC TUBE MANUFACTURING

By Bernard Magers

144 pages, soft cover, 8-½" x 11" format, ISBN 0-9632440-1-9, $16.95 plus shipping, from Antique Electronic Supply, 6221 S. Maple Ave., PO Box 27468, Tempe, AZ 85285-7468, (602) 820-5411, fax (602) 820-4643.

This is a handbook on the products of America's (or the world's?) longest-running maker of electron tubes, covering 1913 to "the end" in 1988. It provides a description of each of 750 or so tube types, in length ranging from a thumbnail summary to a half-page in length, with hard-to-find photos (xerocopied) or line drawings of most of them. There is a basic history of Western Electric, and of Bell Labs as the designer of WECo products, plus extensive material on tube manufacturing processes. The whole product line is there: classic repeater bulbs, miniatures, huge transmitting tubes, klystrons, traveling-wave tubes, magnetrons, cold-cathode relay tubes, famous audio power triodes, exquisitely crafted high-reliability tubes for submarine cable repeaters, CRTs, photocells, even vacuum lightning protectors. There are special military designs that figured in two world wars and the air-defense missile radars of the Cold War. Basic ratings are given, along with information on where the tube was used - telephone carrier systems, radars, microwave systems, theater sound, broadcast equipment, etc.

Magers' book provides a single source for WECo products, far more comprehensive than the charts of characteristics that are the material most widely available (and not *easily* available, at that). It was written with access to source material that is rarely seen. This reference is valuable because it covers far more than the usual receiving tubes from a mass-market maker like, say, Arcturus.

For those wanting to go farther into the history of WECo tubes, a 48-item reference list cites comprehensive sources - mainly the *Bell System Technical Journal*, but also material easier to find.

The author writes with a warmth toward his topic derived from a career in producing tubes, at the long-lived Kansas City Works. In many cases, he apparently had to clarify obscure wording in his source material - BTL/WECo catalog writers had a jargon of their own. This book will probably be the standard reference on post-1930 WECo tubes, many of which are eminently collectable today. Mr. Magers deserves commendation for undertaking this complex project, and A. E. S. for publishing the result. (LAS)

IN QUEST OF THE LIGHT; VISIBLE & INVISIBLE

VHS video, $31.95 postpaid, from New Wireless Pioneers, Box 398, Elma, NY 14059.

This 1-½ hour documentary covers the history (with demonstrations) of Geissler, Crookes, and crude X-ray tubes from the 1890s into the early 1900s. It is one of the most unusual videos I've seen; I had to run through it twice to really appreciate the actual working of these early tubes and their development. The demos were professionally taped with sharp detail. Jim Hardesty does the narration, while Jim Kreuzer and others provide the rare (and weird) working apparatus. It's a great film of an ambitious project that very few would be likely to undertake. (BK)

KOVELS' 1993 COLLECTIBLE PRICE LIST

The Kovels are celebrating their 25th edition, a whopper listing current values of 50,000 items. Although the radio listing is small, the overall information is almost overwhelming, with 874 pages on everything from bottle openers to toy trains - and the price for the book is right - only $13 at most book stores. (BK)

ANTIQUE RADIO RESTORATION GUIDE

By David Johnson

Second ed., 145 pp, 182 illus., 7" x 10" format, soft cover, ISBN 0-87069-638-6, Wallace-Homestead Book Co. (Chilton), Radnor, PA, $14.95 list.

With boundless numbers of individuals getting into repair and restoration of tube radios, there is naturally a need for some "basic training" on this particular skill. That's what this book, or most of it, is about. Of the total pages, 34 are devoted to photos of 30s-50s vintage sets and reprints of radio advertisements of the same period. The rest is the "payload" on basic tube electronics, troubleshooting, and cabinet rework. The basics are laid out fairly simply and clearly, and would probably indeed be useful to a neophyte restorer. A good variety of illustrations, color codes, a basic tube chart, etc. provide support.

There are odd aspects to the text, however. The beginner is offered the *electron-flow* concept of current flow, rather than the modern idea of the flow of positive charge. That's convenient in explaining tube operation, but is no favor to anyone who may work with solid-state electronics later. (Not to mention the problem of remembering the "right-hand rule" vs. the "left-hand rule" for magnetic fields!) There is a bit of gibberish in the AC theory: "The complete change from start to maximum and back is called one cycle, or hertz (Hz)." Unrealism creeps into the description of tube op-

eration: "A change of even a fraction of a volt on the grid is enough to either permit or stop the passage of electrons." The book equivocates on the role of tubes as sources of trouble: "Service literature" is quoted as saying that "at least two-thirds" of receiver troubles are from tube failure, but we are also told that tubes "last a long time because their working parts are contained in a vacuum." (Anyone with hands-on experience in restoration knows how infrequently a tube is the source of a problem.) We are told that "corroded solder joints" are a common cause of intermittent operation. (Experience says otherwise.) Output transformers are cited as a "frequent source of trouble . . . because they carry a relatively high current in their primaries. Any transformer that carries a high current in either winding has a high chance of failure." (*Huh*?) There is a novel theory of leaky bypass capacitors: they "cease to bypass signals to ground, causing oscillation . . . " The novice learns that the oscillator frequency in the typical AC-DC superhet is "lower" than the signal frequency. As an irritating inconsistency, the unit of frequency is variously the *cycle* and the *cycle per second*, with *hertz* thrown in randomly in *mHz* and *MHz* variants. These are small things, but confusing to the learner. They shouldn't have gotten through in a second edition.

To sum up: this is a reasonably good book, of fair value to its intended user, but flawed. (LAS)

THE CATHODE-RAY TUBE
TECHNOLOGY, HISTORY, and APPLICATIONS

By Peter Keller

320 pp., hardbound, 317 illus., 7-½ x 9-¼ format, ISBN 0-9631559-0-3, $69.50, from Palisades Press, 201 Varick St., New York, NY 10014, (212) 620-3375.

The one area where vacuum-tube technology is still alive, and indeed flourishing, is the cathode-ray tube. This holds despite the CRT's having originated well before the first receiving tube, and despite progress in competing displays like LCDs.

This handsomely bound volume provides a sweeping, but detailed, view of the CRT scene. It covers fundamentals and gives the history of CRT development by numerous historic individuals (in this century, by Jonathan Zenneck, Vladimir Zworykin, Philo Farnsworth, Allen Du Mont, and Manfred von Ardenne, to cite the most famous). It then goes into the history of specific types: radar indicators (from the humble 5BP4 to skiatrons, graphechons, tonotrons, etc.), and oscilloscope tubes (with progress from the primitive devices of the '20s to today's flat-faced, rectangular, internal-graticule, fine-resolution, ceramic-bodied, GHz-bandwidth tubes). Next are the stories of television picture tubes: monochrome, color, projection, metal-coned, including the various color-tube designs that never panned out. Separate chapters are devoted to data-display CRTs, tubes for such avionics uses as pilots' heads-up displays, and devices for data recording. A final chapter covers the perennial attempts to replace conventional CRTs with flat designs.

But there's more. Nine appendices provide a list of U. S. CRT makers, famous and forgotten; a cross-reference of types, including a wide variety of special-numbered Du Mont items; a list of phosphor types, from old-time P1 to P57, and the newer two-letter world-wide designation system; EIA and JAN manufacturer codes and date codes; the compositions of CRT phosphors (P43, for example, is gadolinium oxysulfide activated with terbium) and their dates of registration with the EIA; and the colors and makers encoded into the present phosphor-designation system. Evidence of painstaking research is the references section, which cites 814 (!) papers from sources as diverse as the *Proceedings of the Royal Institute* and the *OTB*.

The author writes with professional knowledge and enthusiasm. He explains clearly concepts and design features, some commonplace, some relegated to historical curiosities. Coverage of the inventors as well as the technology adds a human dimension. While there is plenty of history, this is also a "how it works" explanation of a display system in everyday use. The production is not perfect; there are little text flaws here and there (p. 201 got past the proofreader), but they're livable.

Keller's treatise will be of natural interest to television historians and collectors of electronic test equipment (oscilloscopes). An application of this book, intended or not, is as a collector guide on CRTs themselves. Among the illustrations are high-quality photos of 79 tubes ranging from "common" to "unattainable." The wealth of characterization and historical information adds to this potential use.

The author is a career CRT developer, having worked at Tektronix, where numerous innovations in oscilloscope and other display tubes arose in a lengthy competitive contest with Hewlett-Packard.

It's hard to write a review on a poor book, easy to write on an excellent one. This one is excellent. (LAS)

ELECTRONIC PARTS CATALOGUE - 1993

A. G. Tannenbaum, PO Box 110, E. Rockaway, NY 11518, (516) 887-0057, fax (516) 599-6523.

This listing covers a variety of supplies needed in restoration: can and tubular electrolytics of types used in tube radios, including types for AC-DC sets; resistors of all sizes; miscellaneous hardware and parts; and Sams repair data. These include a large variety of old-time Photofacts, and the AR-TSM-CB series books. (If the original manual for a set is unavailable, the original Photofact is a nice accompaniment.) (LAS)

CATALOG: AUDIO CLASSICS

Audio Classics, PO Box 176, Walton, NY 13586, (607) 865-7200, fax (607) 865-7222.

This catalog covers the "tube audiophile" market, with 61 pages - about 1500 items - of tube amplifiers, tuners, preamps, speakers, manuals, etc.. Amplifiers are in the "classic" vein - AR, Dynaco, Hafler, Marantz, McIntosh, Quad, and a slew of "boutique" brands. The firm offers repair and upgrading services on tube components, parts, and tubes. The stuff is a bit pricey, but the catalog gives an idea of where the specialty tube-audio market is going. (LAS)

Not seen but available:

A FIRST CLASS JOB - FRANK MURPHY - RADIO PIONEER

By Joan Long

Format unspecified. Price £7 plus handling and shipping of £1.50 ($15 in U. S. and Canada), from the author at 5c Weybourne Rd., Sheringham, Norfolk, NR26 8HF, England.

According to the promo material, this book covers the history of Frank Murphy and Murphy Radio Limited, the British radio-TV manufacturer founded in 1932s, with emphasis on the company's industrial- and business-relations aspects.

MUSEUM NEWS

A NIGHT IN ADMIRAL DÖNITZ' QUARTERS
OR A VISIT TO THE CHÂTEAU MUSEUM OF PIGNEROLLE

Richard C. Foster

12 Shawmut Ave., Cochituate, MA 01778

In September I turned back the clock and spent a night in the 1944 quarters of the famous German naval commander of WW II, Admiral Dönitz. I occupied the same space, used even his bathtub, all

the while surrounded by unbelievable radios - even a German officer's set. All this was because I paid a visit to Mr. Guy Biraud at his European Museum of Communication near Angers, France. As it happens, this château was HQ for the Atlantic submarine fleet. There is a huge bunker nearby, communicating with the château by mysterious underground passages, where there was a powerful radio station, deep beneath bomb-proof concrete.

The Museum traces the history of communication "from tom-tom to satellite." There is the smoke signal, the Chappé telegraph, the camera, wireless, movies, hi-fi, TV and on and on. There are early telephones, static machines, even satellites. There are sections dedicated to Da Vinci, de Forest, Branly, Marconi. We trace the evolution of the vacuum tube.

Perhaps the most amazing thing is a recreation of the great room of Captain Nemo's *Nautilus* (20,000 Leagues Under the Sea). Other memorable exhibits are a WW I trench site complete with a poilu (French GI) and his wireless gear; a shipboard station; a 1920s amateur station; an early TV studio with a specially recreated camera; and a hall of radios with a spectacular amphitheater filled with sets. There is even a space vessel to travel in. In an annex we find a history of locomotion. Should you fear a boring museum, don't worry. The exhibits, many especially created by artist/sculptor Jacques Lebut, will entrance you, pull you in. This museum represents a lifetime of work by your host Biraud, and you may even sleep where Admiral Dönitz slept if you let him know you're coming.

The museum is at the Château de Pignerolle, outside the fascinating city of Angers in eastern France. The Château was a riding academy for officers and noblemen in the time of Louis XIV and sits in splendid grounds. It houses wonders that you can't imagine until you go see them. Don't miss it. Write: Guy Biraud, Château de Pignerolle, 49125 St. Barthélémy, Angers, France.

THE MUSEUM

UPCOMING EXHIBITS

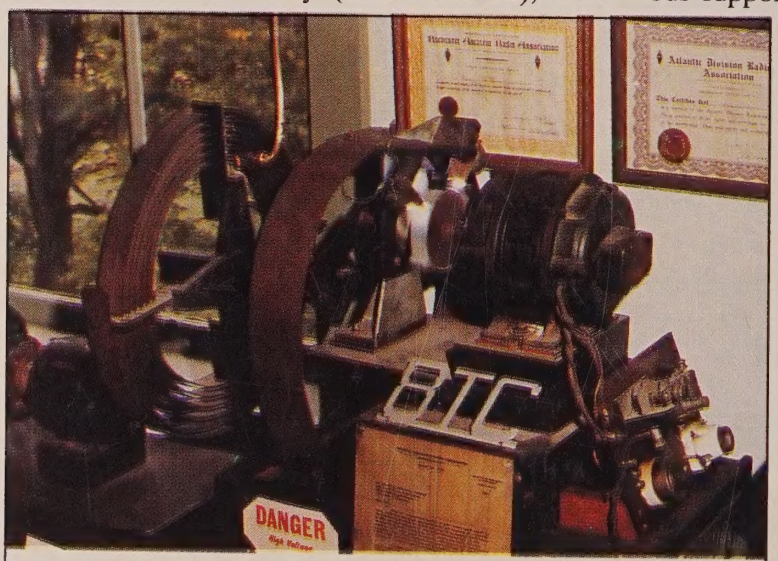
WW II Exhibit: Visitors to the Museum may have noticed the scarcity of military equipment. It had been felt there was little interest in this area. We were wrong. Both ex-service personnel and amateurs can relate to military gear, of which there is a good supply in the Annex. Starting in May, visitors will be able to see everything from a BC-778 Gibson Girl to an ART-13.

The Annex: Our carpenter is working on new shelves to hold a large collection of power transformers, chokes and audio components. Additional shelves will enable Annex workers to properly catalog military items. Don't forget the Spring Auction (May 1). The Association has been given a large assortment of "goodies" to sell with no minimum.

Silent Keys: AWA has a small collection of straight handkeys and some semi-automatic ones used by former members. Given in their memory, the keys are displayed in a showcase with proper identification. The most recent is a 1915 Vibroplex "Blue Racer" which belonged to old-time commercial and amateur operator, Warren Smith, KH6BF. If you would like to donate a key in someone's name, write curator Bruce Kelley.

NEW GEAR IN AWA MUSEUM

Mary Applegate (W2IA); Bill Booker, W4WZU; Hartley Bowen; Robert Brockett; James Colgin; Michael Daley; Sanford Danziger; Bill Ellison; Tag Greene, N2BXG; Bud Hall, K2LP; Edward Herold; Dr. Peter Kelly (cash donation); Fred Linn, W9NZF; Fred Norvik, W2GH; Bob O'Neil, K2AXE; Dora Powlinson (KH6BF); Dick Waddell; Anders Widell; Bob and Tina Wiepert. (BK)



The synchronous spark transmitter donated by George Batterson operating in the Museum. The white fire at center, just left of the motor, is a one-kW spark. A photo is insufficient: you can't see the room light up or hear the awesome sound or smell the ozone!

AWA ELECTRONIC COMMUNICATION MUSEUM

Location: Village Green, Rtes. 5 & 20, Bloomfield, New York
Hours: May 1 through October 31: Sunday, 2-5 PM; June 1 - August 31: Saturday, 2-4 PM; Wednesday, 7-9 PM. (Closed Holidays)
Group tours by appointment: 716-657-7489
Museum telephone: 716-657-6260
Amateur Station: W2AN
FREE ADMISSION

SOME THOUGHTS FOR YOUR WILL

The AWA was founded in 1952 by a group of radio-amateur historians and collectors to explore and preserve the history of wireless communications. Since then, AWA has accumulated a wonderful collection of radio equipment, tubes, photographs, and documents. School children; Girl and Boy Scouts; foreign dignitaries; and professional, industrial and amateur groups visit our museum regularly.

In order to assure the operation of the museum into the future, we need gifts from friends who want it to continue to flourish. Gifts to the AWA Museum are tax-deductible. Also, bequests in a will are a time-honored way of providing continuous support for our museum. For example, you might want to include in your will a bequest of $1,000. If you do, the bequest should read as follows: "I HEREBY GIVE AND BEQUEATH THE SUM OF $1,000.00 TO THE ANTIQUE WIRELESS ASSOCIATION, BLOOMFIELD, NEW YORK, TO BE USED FOR MUSEUM PURPOSES."

Please remember the AWA when you draw your will. If you have any further questions about gifts or bequests, please contact our attorney, Sherwood M. Snyder, 183 E. Main St., Suite 1024, Rochester, NY 14604, (716) 546-7258. If you intend to make a bequest in your will to the AWA for the benefit of our museum, our attorney will draw your entire will at no charge to you if you live in the State of New York. (SMS)